STOCK COMPANY

~~ALL RISKS~~ BUILDERS' RISK DECLARATIONS

THE HOME INSURANCE COMPANY

Manchester, New Hampshire

INSURANCE HOME COMPANIES

BR— 53 92 11

ATLANTA OFFICE, GEORGIA

INSURED'S NAME AND ADDRESS

City of Athens, Georgia
Robert and Company Associates
W.L. Carey, General Contractor, Inc.

PRODUCER

COOK, VIRDEN & PHARR, INC.
Complete Insurance Service / Surety
SUITE 530
TWO NORTHSIDE 75
404/351-8434
BOX 20138
ATLANTA, GA. 30325

SIC 1799

Inception 3-9-81 (Mo. Day Yr.) Expiration 3-9-82 (Mo. Day Yr.)

At noon Standard Time at place of issuance as to each of said dates.

RATE $ Chg PREMIUM* $ 975.00

*Subject to Adjustment when Reporting Form Applicable.

Description and Location of Property Covered

One water intake structure for the city of Athens, Georgia middle Oconee Raw Water Station Job # 800024

The insurance afforded is only with respect to each coverage for which an Amount of Insurance is shown, subject to all the terms and conditions of this policy having reference thereto.

Amount of Insurance	Coverages
$ 1,451,000	A. Property at described location(s)
$ 100,000	B. Property at any other location
$ 100,000	C. Property in transit

$ 75,000 Deductible Applicable

Completed Value Form Provisions Applicable ☒ Yes ☐ No
Reporting Value Form Provisions Applicable ☐ Yes ☒ No

This policy includes: Declarations page 1, Multiple Peril Policy pages 2, 3 and 4, Insuring Agreement No. 1 pages 5 and 6; and the following endorsements and forms

Loss Payable Clause: Loss, if any, to be adjusted with the Insured named herein and payable to the Insured and

(sub-contractors and other interests may be named here) as their respective interests may appear.

In States where required, the statutory fire conditions are made a part of this Policy.

COOK, VIRDEN & PHARR, INC.

Countersigned at Atlanta, Ga. 3-9-81 (Mo. Day Yr.) by BY Authorized Representative

H29437 F

See End't. #1

Insuring Agreement No. 1
~~All Risk~~ Builders' Risk Form

PROPERTY COVERED

This policy covers under:

Coverage A – At location(s), as described in the Declarations, property in course of construction, reconstruction or repair including materials, supplies, machinery, equipment, fixtures and temporary structures used in or incidental to such construction, reconstruction or repair, all the property of the Insured or property for which he is liable.

Coverage B – At any other location, property as described under Coverage A above while in temporary storage in warehouses or other place of storage, within Territorial Limits of this policy, awaiting transit to location described in the Declarations.

Coverage C – In transit, property as described under Coverage A above while in due course of transit within the Territorial Limits of this policy.

PROPERTY EXCLUDED

This policy does not cover:

(a) Accounts, bills, currency, deeds, evidence of debt, money, notes, securities, plans, blueprints, designs or specifications;

(b) Lawns, trees, shrubs or plants unless loss is caused by fire, lightning, aircraft, explosion, riot or civil commotion;

(c) Tools, contractors equipment and any property not a part of or destined to become part of the construction or installation described herein.

PERILS INSURED AGAINST See Endorsement #1

This policy insures against ALL RISKS OF DIRECT PHYSICAL LOSS TO THE PROPERTY COVERED, EXCEPT AS EXCLUDED HEREIN.

EXCLUSIONS AND LIMITATIONS

(a) The "Perils Excluded" section of "General Policy Conditions and Exclusions" is amended to delete subsections A, B, C, D, and E.

(b) This policy does not insure against loss:

(1) By wear and tear, deterioration, rust, corrosion, wet or dry rot, inherent vice, latent defect, mechanical breakdown or derangement, faulty workmanship, marring or scratching;

(2) By frost or freezing;

(3) By unexplained or mysterious disappearance of property (except property in the custody of carriers or bailees for hire) or inventory shortage;

(4) By any fraudulent, dishonest or criminal act done by or at the instigation of any Insured, partner or joint adventurer in or of any Insured, or an officer, director or trustee of any Insured; pilferage, appropriation or concealment of any property due to any fraudulent, dishonest or criminal act of any employee while working or otherwise, or agent of any Insured, or any person to whom the property may be entrusted, other than any carrier or bailee for hire;

(5) By seisure or destruction under quarantine or customs regulations, confiscation by order of any government or public authority, or risks of contraband or illegal transportation or trade;

(6) Occasioned by enforcement of any ordinance or law regulating or restricting the construction, repair, installation or demolition of building(s), structure(s) or other property unless such liability is specifically assumed by endorsement hereon;

(7) Caused by or resulting from:

(a) flood, surface water, waves, tidal water or tidal wave, overflow of streams or other bodies of water or spray from any of the foregoing, all whether driven by wind or not;

(b) earthquake, landslide or other earth movement;

unless loss by fire or explosion ensues, and this Company shall then be liable only for such ensuing loss; but this exclusion shall not apply to property in due course of transit;

(8) Resulting from any electrical injury or disturbance to electrical appliances, devices or wiring caused by electrical currents artificially generated unless fire or explosion ensues, and this Company shall then be liable only for such ensuing loss.

(c) This policy does not insure against loss to:

(1) Component materials or parts of any property

(a) due to testing, or

(b) resulting from faulty design, manufacture, materials or faulty installation of such component materials or parts;

(2) Property shipped via waterborne transportation other than incidental regular ferries or railroad carfloats.

SPECIAL PROVISIONS

(1) *Policy Term.* This policy applies only to losses or occurrences which take place during the policy term from the inception date to expiration date as stated in the Declarations.

(2) *Subrogation Clause.* The "General Conditions" section of "General Policy Conditions and Exclusions" is amended by the addition of the following to sub-section 1J Subrogation:

Except as noted below, this Company shall not be bound to pay any loss if the Insured shall have impaired any right of recovery for loss to the property insured; however, it is agreed that:

(a) as respects real and personal property at the location(s) described in the Declarations, permission is given the Insured to release others in writing from liability for loss prior to loss, and such release shall not affect the right of the Insured to recover hereunder, and

(b) as respects property in transit, the Insured may, without prejudice to this insurance, accept such bills of lading, receipts or contracts of transportation as are ordinarily issued by carriers containing a limitation as to the value of such property.

(3) *Benefit to Bailee.* This insurance shall not inure, directly or indirectly, to the benefit of any carrier or other bailee.

(4) *Occupancy Clause.* It is made a condition of this insurance that the premises shall not be occupied without the written consent of this Company; except machinery may be set up and operated solely for the purpose of testing the same without prejudice to this policy.

(5) *Valuation Clause.* This Company shall be liable only to the extent of the actual cash value of the property covered at the time of loss, but not exceeding the amount which it would cost to repair or replace the property covered with material of like kind and quality within a reasonable time after such loss, without allowance for any increased cost of repair or reconstruction by reason of any ordinance or law regulating construction or repair.

(6) *Deductible Clause.* This Company shall be liable only when loss in each occurrence exceeds the deductible amount indicated in the Declarations and then only for loss in excess thereof. This deductible shall not apply to loss or damage caused by or resulting from fire, lightning, explosion, riot, impact by aircraft or vehicles, and smoke.

(7) *Completed Value Form Provisions.* (The following clause applies only with repsect to Coverage A and only when Completed Value Form Provisions are made applicable in the Declarations.)

Provisional Amount Clause. The amount of insurance stated in the Declarations is provisional. It is a condition of this insurance, wherein the rate and premium are based on an average amount of liability during the period of construction, that at any date while this policy is in force, the actual amount of insurance hereunder is that proportion of the provisional amount that the actual value of the described property on that date bears to the value of the described property at date of completion, but shall not in any case exceed the provisional amount, and:

In consideration of the reduced rate at which this policy is written, it is a condition of this insurance that in the event of loss, this Company shall be liable for no greater proportion thereof than the provisional amount of insurance under this policy bears to the value of the described property at date of completion.

If this policy be divided into two or more items, the foregoing shall apply to each item separately.

(8) *Reporting Form Provisions.* (The following clauses apply only when Reporting Form Provisions are made applicable in the Declarations.)

(a) *Provisional Amount Clause.* The amount of insurance stated in the Declarations is provisional and is for the purpose of determining the initial premium. The actual amount of insurance hereunder shall equal the total value of the property described in the Declarations notwithstanding the requirement that the premium shall be adjusted on the basis of full values reported.

(b) *Value Reporting Clause.* It is a condition that the Insured shall report monthly to this Company the total value of the property covered. Within thirty (30) days after inception of this policy the Insured shall select a day of the month as of which the first and all succeeding monthly reports shall be made; each of such reports to this Company shall be due within thirty days after the day of the month selected. At the time of any loss, if the Insured has failed to file with this Company reports of values as above required, this policy shall cover for not more than the amount stated in the last report of values filed prior to the loss. In the event no initial report as above required has been made within sixty (60) days, this policy shall cover for not more than the provisional amount.

(c) *Full Reporting Clause.* Liability under this policy shall not in any case exceed that proportion of any loss hereunder which the last reported value filed prior to the date of the loss bears to the actual value on the date for which the report was made.

(d) *Premium Adjustment Clause.* The premium named in this policy is provisional only. The actual premium consideration for the liability assumed hereunder shall be determined as follows: upon receipt of each report of value, this policy shall be endorsed to the amount of the value reported; additional or return premiums being computed on a pro rata basis to the expiration date of the policy from the date midway between the dates of the current and the preceding report.

(e) *Verification of Values.* This Company or its duly appointed representative, shall be permitted at all reasonable times during the term of this policy, or within a year after its expiration, to inspect the property covered hereunder and to examine the Insured's books, records and such policies as relate to any property covered hereunder. This inspection or examination shall not waive or in any manner affect any of the terms or conditions of this policy.

ALL OTHER TERMS AND CONDITIONS OF THE POLICY NOT IN CONFLICT HEREWITH REMAIN UNCHANGED.

INSURANCE HOME COMPANIES

NON-PREMIUM ENDORSEMENT

Endorsement No. 1

Issued by — *(Type in full name of Insuring Company)*

POLICY NUMBER

NAMED INSURED

"The Attaching Clause need be completed only when this endorsement is issued subsequent to preparation of the policy."

EFFECTIVE DATE AND TIME OF ENDORSEMENT

DATE PREPARED

POLICY EXPIRATION

PRODUCER

PRODUCER NO.—OPC

It is agreed that this policy is hereby amended as indicated. All other terms and conditions of this policy remain unchanged.

Perils insured against is amended to read:

a) Fire, Lightning

b) Windstorm and Hail, it being agreed, however, that this Company shall not be liable for loss or damage caused directly or indirectly by frost or cold, tidal wave, high water or overflow, whether driven by wind or not; nor for loss or damage caused by rain, snow, sand or dust, whether driven by wind or not, except for such loss or damage as may be caused directly by rain, snow, sand or dust immediately entering the building through openings in roof or walls made as a direct result of windstorm, or hail.

c) Explosion, meaning thereby direct loss or damage caused by explosion except for loss or damage resulting from the explosion, collapse, rupture or bursting of steam boilers, steam engines, steam pipes, and apparatus connected therewith or moving or rotating parts of machinery.

d) Aircraft, meaning thereby direct loss or damage caused by aircraft, including loss or damage caused by objects falling therefrom.

e) Motor vehicles, excepting motor vehicles owned and/or operated by or for the assured or by or for any custodian of the property.

f) Smoke damage, meaning thereby the sudden, unusual and faulty operation of any stationary heating furnace, excluding, however, smoke from industrial apparatus,

g) Strikers, locked-out workmen or persons taking part in labor disturbances, or riots or civil commotions but nevertheless warranted free of any and/or all claims for delay, deterioration and/or loss of market and/or exposure to the elements. This clause may be cancelled by either party giving the other five days' written notice thereof.

SIGNATURE OF AUTHORIZED REPRESENTATIVE

COOK, VIRDEN & PHARR, INC.

BY

H22300FH 4/77

MULTIPLE PERIL POLICY

THE HOME INSURANCE COMPANIES

In consideration of the payment of premium, this Company does insure the Insured named in the Declarations subject to all of the terms and conditions of this Policy including all of the terms and conditions of the Declarations and Insuring Agreement(s) which are made a part hereof.

GENERAL POLICY CONDITIONS AND EXCLUSIONS

UNLESS PHYSICALLY DELETED BY THE COMPANY OR UNLESS SPECIFICALLY REFERRED TO IN THE INSURING AGREEMENT(S), THE FOLLOWING CLAUSES SHALL BE PARAMOUNT AND SHALL SUPERSEDE AND NULLIFY ANY CONTRARY PROVISONS OF THE INSURING AGREEMENT(S).

1. GENERAL CONDITIONS

A. TERRITORIAL LIMITS: This Policy insures only while the property is at locations and while in transit within and between the forty-eight contiguous states of the United States of America, the District of Columbia and Canada, unless otherwise endorsed.

B. REMOVAL: Such insurance as is afforded by this Policy applies while the property covered is being removed to and while at place of safety because of imminent danger of loss, damage or expense and while being returned from such place, provided the Insured gives written notice to this Company of such removal within ten days thereafter.

C. OTHER INSURANCE: If there is available to the Insured or any other interested party any other insurance which would apply in the absence of this Policy, the insurance under this Policy shall apply only as excess insurance over such other insurance.

D. ASSIGNMENT: Assignment of interest under this Policy shall not bind the Company until its consent is endorsed hereon; if, however, the Insured shall die, or shall be adjudged bankrupt or insolvent and written notice is given to the Company within sixty days after the date of such adjudication, this Policy shall cover the Insured's legal representative as insured; provided that notice of cancelation addressed to the Insured named in this Policy and mailed to the address shown in this Policy shall be sufficient notice to effect cancelation of this Policy.

E. MISREPRESENTATION AND FRAUD: This Policy shall be void if the Insured has concealed or misrepresented any material fact or circumstance concerning this insurance or the subject thereof or in case of any fraud, attempted fraud or false swearing by the Insured touching any matter relating to this insurance or the subject thereof, whether before or after a loss.

F. NOTICE OF LOSS: The Insured shall as soon as practicable report to this Company or its agent every loss or damage which may become a claim under this Policy and shall also file with the Company or its agent within ninety (90) days from date of loss a detailed sworn proof of loss. Failure by the Insured to report the said loss or damage and to file such sworn proof of loss as hereinbefore provided shall invalidate any claim under this Policy for such loss.

G. SETTLEMENT OF LOSS: All adjusted claims shall be paid or made good to the Insured within thirty days after presentation and acceptance of satisfactory proofs of interest and loss at the office of this Company. No loss shall be paid or made good if the Insured has collected the same from others.

H. SUE & LABOR: In case of loss or damage, it shall be lawful and necessary for the Insured, or his or their factors, servants and assigns, to sue, labor and travel for, in and about the defense, safeguard and recovery of the property covered hereunder, or any part thereof, without prejudice to this insurance; nor shall the acts of the Insured or this Company, in recovering, saving and preserving the property covered in case of loss or damage, be considered a waiver or an acceptance of abandonment, to the charge whereof this Company will contribute according to the rate and quantity of the sum herein insured.

I. SUIT: No suit, action or proceeding for the recovery of any claim under this Policy shall be sustainable in any court of law or equity unless the same be commenced within twelve (12) months next after discovery by the Insured of the occurrence which gives rise to the claim. Provided, however, that if by the laws of the State within which this Policy is issued such limitation is invalid, then any such claims shall be void unless such action, suit or proceeding be commenced within the shortest limit of time permitted by the laws of such State.

J. SUBROGATION: In the event of any payment under this Policy the Company shall be subrogated to all the Insured's rights of recovery therefore against any person or organization and the Insured shall execute and deliver instruments and papers and do whatever else is necessary to secure such rights. The Insured shall do nothing after loss to prejudice such rights.

K. APPRAISAL: If the Insured and the Company fail to agree as to the amount of loss, each shall, on the written demand of either, made within sixty (60) days after receipt of proof of loss by the Company, select a competent and disinterested appraiser, and the appraisal shall be made at a reasonable time and place. The appraisers shall first select a competent and disinterested umpire, and failing for fifteen days to agree upon such umpire, then, on the request of the Insured or the Company, such umpire shall be selected by a judge of a court of record in the county and state in which such appraisal is pending. The appraisers shall then appraise the loss, and failing to agree shall submit their differences to the umpire. An award in writing of any two shall determine the amount of loss. The Insured and the Company shall each pay its chosen appraiser and shall bear equally the expenses of the umpire and the other expenses of appraisal. The Company shall not be held to have waived any of its rights by any act relating to appraisal.

L. EXAMINATION UNDER OATH: The Insured shall submit, and so far as is within his or their power shall cause all other persons interested in the property and employees to submit, to examinations under oath by any persons named by the Company, relative to any and all matters in connection with a claim and subscribe the same; and shall produce for examination all books of account, bills, invoices, and other vouchers or certified copies thereof if originals be lost, at such reasonable time and place as may be designated by the Company or its representatives, and shall permit extracts and copies thereof to be made.

M. AUTOMATIC REINSTATEMENT: Any loss hereunder shall not reduce the amount of the Policy.

N. CANCELATION: This Policy may be canceled by the Insured by mailing to the Company written notice stating when thereafter such cancelation shall be effective. This Policy may be canceled by the Company by mailing to the Insured at the address shown in this Policy written notice stating when not less than ten (10) days thereafter such cancelation shall be effective. The mailing of notice as aforesaid shall be sufficient proof of notice and the effective date of cancelation stated in the notice shall become the end of the policy period. Delivery of such written notice either by the Insured or by the Company shall be equivalent to mailing.

If the Insured cancels, earned premiums shall be computed in accordance with the customary short rate table and procedure. If the Company cancels, earned premiums shall be computed pro rata. Premium adjustment may be made at the time cancelation is effected and, if not then made, shall be made as soon as practicable after cancelation becomes effective. The Company's check or the check of its representative mailed or delivered as aforesaid shall be a sufficient tender of any refund of premium due to the Insured.

O. CONFORMITY TO STATUTE: Terms of this Policy which are in conflict with the statutes of the State wherein this Policy is issued are hereby amended to conform to such statutes.

2. **PERILS EXCLUDED:** This Policy does not insure against loss, damage or expense caused directly or indirectly by:

A. Damage due to mechanical failure, faulty construction, error in design, inherent vice, wear, tear, gradual deterioration or depreciation;

B. Corrosion, rust, dryness or dampness of atmosphere, or extremes of temperature;

C. Infidelity or any dishonest act, or inefficient or negligent handling of the property covered on the part of the Insured or other party of interest, his or their employees or agents or others to whom the property may be entrusted (carriers for hire excepted);

D. Short circuit, blow-out, or other electrical disturbance, other than lightning, within electrical apparatus, unless fire or explosion ensues and then only for loss, damage or expense caused by such ensuing fire or explosion;

E. Actual work upon the property covered, unless fire or explosion ensues, and then only for loss, damage, or expense caused by such ensuing fire or explosion;

F. Delay or loss of market;

G. (1) Hostile or warlike action in time of peace or war, including action in hindering, combating or defending against an actual impending or expected attack, (a) by any government or sovereign power (de jure or de facto), or by any authority maintaining or using military, naval or air forces; or (b) by military, naval or air forces; or (c) by an agent of any such government, power, authority or forces;

(2) Any weapon of war employing atomic fission or radioactive force whether in time of peace or war;

(3) Insurrection, rebellion, revolution, civil war, usurped power, or action taken by governmental authority in hindering, combating or defending against such an occurrence, seizure or destruction under quarantine or Customs regulations, confiscation by order of any government or public authority, or risks of contraband or illegal transportation or trade;

H. Nuclear reaction or nuclear radiation or radioactive contamination, all whether controlled or uncontrolled, and whether such loss be direct or indirect, proximate or remote, or be in whole or in part caused by, contributed to, or aggravated by the peril(s) insured against in this Policy; however, subject to the foregoing and all provisions of this Policy, direct loss by fire resulting from nuclear reaction or nuclear radiation or radioactive contamination is insured against by this Policy.

THIS POLICY IS MADE AND ACCEPTED SUBJECT TO THE FOREGOING STIPULATIONS AND CONDITIONS, together with such other provisions, agreements or conditions as may be endorsed hereon or added hereto; and no officer, agent or other representative of this Company shall have power to waive or be deemed to have waived any provision or condition of this Policy unless such waiver, if any, shall be written upon or attached hereto, nor shall any privilege or permission affecting the insurance under this Policy exist or be claimed by the Insured unless so written or attached.

In Witness Whereof, the said THE HOME INSURANCE COMPANY, NEW YORK has caused these Presents to be signed by its President and attested by its Secretary, in the City of New York, and this policy is made and accepted upon the above express conditions, but shall not be valid unless countersigned on Declarations Page by a duly Authorized Representative of the Company at place of issue.

Secretary

President

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City Cy.

SPECIFICATIONS

COVERING

MIDDLE OCONEE
RAW WATER STATION

FOR

CITY OF ATHENS
ATHENS, GEORGIA

LAUREN M. COILE, MAYOR
WILLIAM T. COOK, ADMINISTRATIVE ASSISTANT
DENNY C. GALIS, CITY ATTORNEY
H. LAMAR PITTARD, CITY ENGINEER
BENTON H. WILLIAMS, ASST. CITY ENGINEER
RALPH CARTER, WATER PLANT SUPT.
BOYD MANGUM, DISTRIBUTION SYSTEM SUPT.

CITY COUNCIL

GEORGE M. HESTER
EDWARD L. TURNER
JERRY F. NICHOLSON
FRED B. LEATHERS, JR.
LEWIS SHROPSHIRE, JR.
JOHN E. TAYLOR
DWAIN P. CHAMBERS
HUGH R. HALE
NANCY DENSON
W. CALVIN BRIDGES

JOB NO. 800024

DATE: JULY 21, 1980

Robert and Company Associates
Architects—Engineers—Planners
96 Poplar Street, N.W. Atlanta, Georgia 30303

ADDENDUM NO. 1
TO
SPECIFICATIONS AND CONTRACT DOCUMENTS
COVERING
MIDDLE OCONEE RAW WATER STATION
FOR
THE CITY OF ATHENS, GEORGIA

JOB NO. 800024 JULY 21, 1980

DATE OF THIS ADDENDUM: October 30, 1980

DATE OF BID OPENINGS: November 20, 1980

The Drawings, Specifications, and other Contract Documents are hereby revised as follows:

1. Revised Drawings No. 800024-G4 to delete the reference to "MJ-PE" noted for the 30" DI 90 deg. bend at the raw water discharge header outside the south wall of the station structure.

2. On Page 13W1-2 of the Specifications under Restrained Joints (RJ), revise the last two sentences to read as follows:

> "Use corrosion resistent alloy bolts and rubber gaskets complying with ANSI A21.11. Use restrained joints for all exterior raw water pressure piping unless otherwise noted."

3. On page GC-10 of the Specifications, revise the last sentence of paragraph 21.a. to read as follows:

> "All rejected materials, equipment, or work shall be replaced with other equipment, materials, or work which conforms to the Drawings and Specifications, at no additional cost to the Owner."

ROBERT AND COMPANY ASSOCIATES
96 POPLAR STREET, N.W.
ATLANTA, GEORGIA 30335

4. On page 13W3-3 of the Specifications under Vertical Turbine Pumps, revise the maximum shutt-off head for units VTP1-1, 2, and 3 from 270 feet to 315 feet.

ADDENDUM NO. 2

TO

SPECIFICATIONS AND CONTRACT DOCUMENTS

COVERING

MIDDLE OCONEE RAW WATER STATION

FOR

THE CITY OF ATHENS, GEORGIA

JOB NO. 800024 JULY 21, 1980

DATE OF THIS ADDENDUM: November 11, 1980

DATE OF BID OPENINGS: November 20, 1980

The Drawings, Specifications, and other Contract Documents are hereby revised as follows:

1. On page GC-12 of the Specifications, delete paragraph 26.a. and replace with the following paragraph:

> "The Contractor will furnished, unless otherwise provided, all lines, grades and measurements necessary in laying out the Work. The Engineer will furnish control surveys and bench marks as required. The Contractor must exercise proper care and caution to verify the grades and figures given him and carefully check all dimensions before proceeding with the Work, and shall be responsible for any damage or defective work caused by his failure of such care and caution. He shall promptly notify the Engineer of any errors or discrepancies he may discover in order that the proper corrections may be made."

2. Revise Drawing No. G3 (Sht. 3) to indicate 6 inch concrete block (CMU) in lieu of the 4"CMU indicated on the north walls of the toilet and storage room, and to indicate a 6"CMU return at the storage room door and the 12"CMU wall.

3. On page 13WI-14 of the Specifications, all the following statements under GENERAL:

"Thoroughly clean all piping and flush all pressure piping prior to testing. Refer to Section 9A for painting requirements."

4. On Sections A and B, Drawing No. G4, the sleeve for the 12 inch D.I. blow-off pipe shall be fabricated from steel pipe.

ADDENDUM NO. 3
TO
SPECIFICATIONS AND CONTRACT DOCUMENTS
COVERING
MIDDLE OCONEE RAW WATER STATION
FOR
THE CITY OF ATHENS, GEORGIA

JOB NO. 800024 JULY 21, 1980

DATE OF THIS ADDENDUM: November 14, 1980

DATE OF BID OPENINGS: November 20, 1980

The Drawings, Specifications, and other Contract Documents are hereby revised as follows:

1. On page 13WI-13 of the Specifications, add the following under INSTALLATION, GENERAL:

> "Provide complete piping systems including pipe, fittings, valves, sleeves, gaskets and other joint materials, caulking, hangers and supports, blocking, inserts, and other components necessary for complete operational piping system suitable for its intended use.
>
> Refer to the Drawings and coordinate process piping work accordingly. Modify piping, subject to Engineer's approval, where required by equipment furnished or by location of any existing facilities or improvements. Install sleeves, bolts, and inserts as structure construction progresses.
>
> Unless otherwise indicated, install underground piping to maintain a minimum cover of 30 inches."

2. On Section A, Drawing No. G7, add the following elevations as indicated.

    a. Top of Concrete El. 590.50.
    b. Fin. Grade 588.50.
    c. 30 inch Venturi-Centerline Elevation 584.50.

3. On Drawing No. G2 under Site Notes, add the following note:

"6. Install all yard piping underground,unless otherwise noted, maintaining a minimum of 30 inches cover."

4. On page 13W1-3 of the Specifications, delete the paragraph entitled "Butterfly Valves" and add the following paragraph:

"Butterfly Valves (BFV): Use rubber seated, iron body butterfly valves complying with AWWA C504. Use end type as required for connecting piping. Provide manual reducer, extension stem, operating nut and valve box for all buried valves and provide manual reducer and removable handwheel for all non-buried valves, unless otherwise indicated or required. Use valves suitable for 250 psi service with operators selected and sized for 150 psi normal operating pressure."

5. On Page 13W1-3 of the Specifications, under Check Valves, Non-Slam, revise the pressure rating from 150 psi service to 250 psi service.

6. On page 13W1-4 of the Specifications under Galvanized Steel Piping System, revise the pressure rating for Gate Valves and Check Valves from 150 psi to 250 psi.

7. On Drawing No. G-3 at Spray Pump No, VTP1-4, add a note to indicate a 4 inch Check Valve (CV/NS) as typical.

8. On Drawing No. G-4 at the "6 inch flat type silent ck.v.," delete the "NCV" and replace with "CV/NS."

9. On page 13W1-9 of the Specifications under Surge Anticipator Valve, add the following paragraph:

"Furnish valves manufactured by firms having a factory trained and employed service representative within the State of Georgia or within two hundred (200) miles of the installation. Have initial settings and field adjustments performed by said representative."

10. On page 13B-16 of the Specifications under Flow Meter, revise "Operating Pressure" to read "Normal Operating Pressure," and add the following:

"Flow meter shall be rated for 250 psi maximum working pressure, and shall be factory tested to not less than 375 psi."

11. On Drawing No. G-4, at the "Pressure Switch Manifold Detail," revise the pressure gauge from 0-120 to 0-300 psi.

12. On page 13W1-11 of the Specifications under Pressure Switches, adjust initial set points as follows:

PS-1	30 psi
PS-2	100 psi
PS-3	5 psi
PS-4	40 psi

13. On Drawing No. G-4, on the Ball Valve Water Supply Header Detail, between the corporation stop and the gate valve on the 1 inch copper pipe, include a 1 inch pressure reducing valve, Watts No. U5 or equal, suitable for 300 psi initial pressure and set for 75 psi downstream pressure, with an integral strainer. Add a 1 inch gate valve upstream of the regulator.

ROBERT AND COMPANY ASSOCIATES
96 POPLAR STREET, N.W.
ATLANTA, GEORGIA 30335

SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

MIDDLE OCONEE RAW WATER STATION

FOR

THE CITY OF ATHENS, GEORGIA

JOB NO. 800024

DATE: JULY 21, 1980

ROBERT AND COMPANY ASSOCIATES
ARCHITECTS-ENGINEERS-PLANNERS
96 POPLAR STREET, N. W.
ATLANTA, GEORGIA 30303

SECTION TC

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SECTION AB

ADVERTISEMENT FOR BIDS:

Sealed bids will be received by the City of Athens, Georgia at City Hall, Athens, Georgia, until 2:00 P.M. Local Time on November 20, 19 80 , at which time and place the bids will be publicly opened and read aloud. Proposals received after the designated time will not be considered.

The Contractor's bid will include the furnishing of all labor, materials, and equipment and for the construction of:

MIDDLE OCONEE

RAW WATER STATION

JOB NO. 800024

Project work generally consists of the construction of a 16 M.G.D. river water intake and pumping station, complete and operational, including structure, pumps, piping, screens, controls, telemetry, site work, and all other related work.

The site is located off Mitchell Bridge Road at the Middle Oconee River in Athens, Georgia. Modifications to the existing Water Treatment Plant located on Waterworks Drive will also be required.

Drawings, Specifications, and other Contract Documents are available for inspection by the public at the following locations: Office of the City Engineer, City Hall, Athens, Georgia; Robert and Company Associates, 96 Poplar Street, N. W., Atlanta, Georgia 30303; F. W. Dodge Division, Plan Room, 1316 West Peachtree Street, N. W., Atlanta, Georgia.

A complete set of documents may be obtained from the office of Robert and Company Associates, Architects-Engineers-Planners, 96 Poplar Street, Atlanta, Georgia 30303. A non-refundable fee of seventy-five dollars ($75.00) is required for each set of documents.

No proposal will be considered unless accompanied by a certified check or acceptable Bid Bond in an amount not less than five percent (5%) of the bid and made payable to the City of Athens, Georgia (Owner).

All bids must be made out on the separate proposal form furnished with the Contract Documents in accordance with the Instructions to Bidders. No interlineations, additions or deletions shall be made in the proposal form by the Bidder.

Successful Bidder shall be required to furnish a Contract Performance Bond in the amount of 100% of the Contract Price and a Payment Bond in the amount of 100% of the Contract Price.

The Owner reserves the right, with or without notice or cause to accept any bid regardless of the amount thereof, to reject any bid, any number of bids or all bids; to negotiate with any bidder for a reduction or alteration in its bid; to waive or insist upon formal requirements; to reject all bids and to call for additional bids upon the same or different invitation to bid, plans and specifications; to be the sole judge, in its discretion, of all questions as to whether or not a bid complies with the invitation to bid, the Drawings or the Specifications, as to the qualifications of a Bidder to perform the Contract, and as to the solvency and sufficiency of any and all Sureties on any and all Bonds.

Bidders shall inform themselves concerning local laws and comply with same.

No Bidder may withdraw his bid within 60 days after the actual date of the opening thereof.

The successful Bidder shall commence work with adequate force and equipment on a date to be specified in the Notice to Proceed and shall complete the work within the time specified in the Proposal, from and including said date.

Owner: Mayor and Council of the City of Athens, Georgia

By: Lauren M. Coile, Mayor

Date: July 21, 1980

SECTION IB

INSTRUCTIONS TO BIDDERS:

01. GENERAL:

a. Bidders are required to examine the Drawings, Specifications, and other Contract Documents carefully and to make such examinations of the site of the proposed work as are necessary to familiarize themselves with the nature and extent of the work to be done and with all local conditions which may affect the proposed construction. Bidders are also required to inform themselves fully in regard to construction and labor conditions under which the work will be performed. The Owner will not be responsible for Bidders' errors or misjudgment, nor for any information on local conditions or general laws and regulations.

b. Insofar as practicable, the Contractor shall so schedule his operations and employ such methods of carrying out the work that he will not cause any interruptions of, or interference with the work of any other Contractor.

02. LOCATION AND SITE:

a. The work included in this Contract is located in Athens, Georgia, in the location(s) shown on the Drawings.

The Contractor shall accept the site in its present condition and carry out all work in accordance with the requirements of the Specifications and as shown on the Drawings.

b. The present and finish grades may be shown on the Drawings, however, the Contractor shall, before submitting his bid, visit the site and acquaint himself with the actual conditions of the ground, and actual ground elevations, and the locations of any or all obstructions that may exist on the site.

03. MAKING BIDS:

a. All bids must be submitted on Proposal forms bound herein. All proposals must be signed in ink by the person, or persons authorized to sign same. Each item of the Proposal must be bid on.

04. AUTHORITY TO SIGN:

a. If a proposal is made by an individual, his name and Post Office address must be shown. If made by a firm, or partnership, the Partnership Certificate must be executed, and the

name and Post Office address of each member of the firm or partnership must be shown, and the Proposal shall be executed by the firm owner or partner. If made by a Corporation, the Corporation Certificate must be executed,and the person, or persons, signing the Proposal must show the name of the State under the laws of which the Corporation is chartered and his, or their, authority for signing same; and the names, titles and addresses of the President, Secretary, and Treasurer, and the Corporate authority for doing business in this State, and the Proposal shall be executed by the President or Vice-president.

05. SUBMITTING BIDS:

a. Each bid must be submitted in a sealed envelope, bearing on the outside the name of the Bidder, his or their adress, and date and hour of opening, and shall be marked on the outside as follows:

Proposal for Construction of the

Middle Oconee Raw Water Station

City of Athens, Georgia

Job No. 800024

06. BIDDER'S QUALIFICATIONS:

a. Proposals will be considered only from qualified, experienced, and well-equipped contractors.

b. The Onwer may require a contemplated awardee to submit a letter setting forth qualifications which entitle him to consideration as a responsible bidder and listing his experience on work of a similar character, and equipment available for this work.

07. INTERPRETATIONS:

a. Requests for interpretations of Drawings and Specifications must be made in writing to the Engineer. Such request must be received by the Engineer not later than five (5) days prior to receipt of Proposals. Any interpretations made to bidders will be issued in the form of Addenda to the Contract Documents and sent to all bidders.

08. WITHDRAWAL OF PROPOSAL:

a. No bidder may withdraw his bid for a period of sixty (60) days after the date set for the opening thereof.

09. REJECTION OF IRREGULAR PROPOSALS:

a. Proposals will be considered irregular, and may be rejected, if they show serious omissions, alteration of form, additions not called for, conditions or unauthorized alternate bids, or irregularities of any kind.

10. GUARANTEE TO ACCOMPANY PROPOSAL:

a. No Proposal will be considered unless accompanied by a certified check or acceptable Bid Bond in an amount not less than five percent (5%) of the bid and made payable to the Owner.

11. RETURN OF PROPOSAL GUARANTEES

a. All proposal guarantees made in the form of certified checks or cash, will be returned within ten (10) days following the opening of proposals, if requested, except those of the three lowest bidders, which will not be returned until after a satisfactory bond has been furnished and the Contract has been executed.

12. CONTRACT PERFORMANCE BOND AND PAYMENT BOND:

a. The Contractor will be required to furnish a Contract Performance Bond and a Payment Bond , each in an amount equal to 100 percent of the Contract price, as security for the payment on all persons performing labor and furnishing materials in connection with the Contract, and in accordance with the provisions of the General Conditions and Special Conditions. The form of the bonds shall be as attached to these Specifications and the Surety shall be acceptable to the Owner. In case of default on the part of the Contractor, all expenses incidental to ascertaining and collecting losses under the bonds, including both engineering and legal services, shall lie against the bonds.

b. The Contractor will be required to give a one-year guarantee covering workmanship and materials. The Contract Bonds shall remain in force for one year from date of final acceptance of the equipment, materials, and construction.

c. The Surety Bonds shall be countersigned by a local agent.

13. FAILURE TO EXECUTE CONTRACT:

a. Failure to execute contract, file acceptance bonds and furnish Certificates of Insurance, as provided herein, within

ten (10) days from the date of award, shall be just cause for the annulment of the award and for the forfeiture of the Proposal Guaranty to the Owner, not as a penalty, but in liquidation of damages sustained. At the discretion of the Owner, the award may then be made to the next lowest responsible bidder, or the work may be readvertised or constructed by day labor. The Contract and Contract Bonds shall be executed in quadruplicate.

14. INSURANCE, PROOF OF CARRIAGE:

a. The Contractor will be required to furnish the Owner and Engineer with satisfactory proof of carriage of the insurance required. Such proof shall be furnished to the Owner within ten (10) days of the date of the Notice of Award, and shall be in accordance with the General Conditions and Special Conditions.

15. RIGHTS RESERVED:

a. The Owner reserves the right, with or without notice or cause to accept any bid regardless of the amount thereof; to reject any bid, any number of bids or all bids; to negotiate with any bidder for a reduction or alteration in its bid; to waive or insist upon formal requirements; to reject all bids and to call for additional bids upon the same or different invitation to bid, plans and specifications; to be the sole judge, in its discretion, of all questions as to whether or not a bid complies with the invitation to bid, the Drawings or the Specifications,as to the qualifications of a bidder to perform the Contract, and as to the solvency and sufficiency of any and all Sureties on any and all bonds.

16. BIDDER'S NOTICE:

a. Bidders are hereby notified and agree by submission of their proposal that should, after award of the Contract, additional items not listed in the proposal become necessary and require unit prices not established by the Proposal, that the unit prices of such items shall be negotiated and shall be directly proportional to the established unit prices of similar items in the Proposal.

17. TIME:

a. Time is of utmost importance in the construction of this Contract. The successful bidder will be required to commence the Work with adequate force and equipment within ten (10) days of the date of the Notice to Proceed, and complete the Work within the time specified in the Proposal, from and including said date.

b. If said work is not complete within the time specified, the Contractor shall be liable to the Owner for liquidated damages and not as a penalty, in the amount stipulated in the Contract per calendar day for each and every day or part of a day thereafter that said work remains substantially incomplete.

18. AWARD:

a. The award will be made, as soon as practical, to that bidder who in the judgment of the Owner will best serve the interests of the Owner. This decision will be based upon the amount bid; the experience and qualifications of the bidder; the equipment to be supplied; and all other conditions set forth in these Contract Documents.

19. INFORMATION TO BE FURNISHED WITH PROPOSAL:

a. Each Bidder shall submit with his Proposal the names of manufacturers and representatives or vendors the bidder proposes to use, and on which his bid is based, for each item of equipment listed on the Proposal.

20. LOCAL AND STATE LAWS AND ORDINANCES:

a. The Contractor shall abide by all local and State laws or ordinances.

SECTION P

PROPOSAL:

Place: Office of the City Engineer, City Hall, Athens, Ga. 30603

Date: November 20, 1980

Project: Middle Oconee Raw Water Station

Job No. 800024

TO: The Mayor and Council of the
City of Athens, Georgia

Gentlemen:

In compliance with your Notice to Bidders, the undersigned, hereinafter termed the Bidder, proposes to enter into a contract with the Mayor and Council of the City of Athens, Georgia, to perform the work and furnish the materials and equipment in the amount stipulated herein and to do so within the time periods herein defined, and in full conformity with the Drawings and Specifications which are attached hereto and made a part thereof.

The Bidder has carefully examined and fully understands the Contract, Drawings and Specifications, and other Contract Documents hereto attached, and has made a personal examination of the site of the proposed work, and has satisfied himself as to the actual conditions and requirements of the work, and hereby proposes and agrees that if his proposal is accepted, he will contract with the Mayor and Council of the City of Athens, Georgia, in full conformance with the Contract Documents.

The undersigned Bidder proposes to construct the following items for the following prices:

Item No.	Description	Quantity	Unit	Unit Price	Amount
1.	Furnishing all labor, materials, and equipment to construct and place into permanent operation, the Middle Oconee Raw Water Station complete, including site work, earthwork, building and other structures, pumps, screens, and other equipment, piping, electrical,				

Item No.	Description	Quantity	Unit	Unit Price	Amount
	controls and instrumentation, painting, and other work as identified in the Contract Documents.		L.S.	$ 1,644,497.00	
2.	Stated Allowances as stipulated in the Special Conditions.		L.S.	$ 2,200.00	
3.	Total Adjustment Price.			$ 4,500.00	
	TOTAL AMOUNT BID			$ 1,651,197.00	

The undersigned Bidder acknowledges receipt of Addenda No.'s

No. 1, No. 2, & No. 3.

Other Contracts and Deductions:

Proposals for construction of other water system work will be received at the same time and place. In the event that the undersigned Bidder is awarded this Contract and the contract for Additions To The Water System, Contract No. 1, Job No. 800023-01, for the City of Athens, Georgia, the Bidder proposes to reduce the amount of Bid Item No. 1 for the Raw Water Station by the following amount: $200,000.00, thereby reducing the TOTAL AMOUNT BID to the following amount: $ 1,451,197.00.

In conjunction with other contracts mentioned above, the Bidder is advised that the Owner reserves the right to award each contract to separate Bidders or both contracts to a single Bidder.

Adjustment Unit Prices:

The undersigned Bidder also agrees to modify or delete specified work or perform additional work at the following Adjustment Unit Prices and to include the following stated quantities of additional work as follows:

Item No.	Item	Qty.	Unit	Unit Price	Amount
1A	Rock Excavation	1000	Cy.	$ 0	$ 0
2A	Reinforced Concrete	100	Cy.	$45.00	$4500.00
	TOTAL ADJUSTMENT PRICE				$4500.00

(Insert in Bid Item No. 3)

The undersigned Bidder has included the total of the above items (Total Adjustment Price) in his bid in the space provided, and agrees that no payment will be made under any adjustment unit price for work identified by the Drawings, Specifications, or other Contract Documents.

These quantities may be increased, decreased, or deleted and the Contract Price adjusted accordingly for actual work constructed, without invalidating the Adjustment Unit Prices bid.

The above items are for the purpose of adjusting bid prices, as set forth in the General Requirements.

In case of discrepancies between the figures shown for the Unit Prices and Amounts, the Unit Prices shall govern and other items shall be corrected to agree.

The Bidder must bid on every item as listed in the Proposal.

It is understood and agreed that any quantities listed in this Proposal are approximate only and are intended principally to serve as a guide in comparing bids, and may be increased or decreased without invalidating the unit prices bid.

The Bidder further proposes and agrees hereby to promptly commence the work with adequate work force and equipment within ten (10) days of the date to be specified in the Notice to Proceed, and to complete the work within three hundred and sixty-five (365) consecutive calendar days from and including said date. The Bidder also proposes and agrees to pay as liquidated damages, the amount of two hundred and fifty dollars ($250.00) for each and every consecutive calendar day thereafter that the work remains substantially incomplete, in accordance with the provisions of the General Conditions.

Attached hereto is a certified check or bid bond on the ______

Five Percent ______ of Total Amount Bid

in the amount of ______

______ Dollars ($______) according to the provisions of the Instructions to Bidders.

The undersigned furthermore agrees that, in case of failure on his part to execute said Contract and bonds, or furnish acceptable certificates of insurance, within ten (10) days after being awarded the Contract, the check or bond accompanying his bid and the money payable thereon, shall become the property of the City of Athens, Georgia otherwise, the check or bond accompanying his Proposal shall be returned to the undersigned.

The undersigned, as Bidder, hereby declares; that the only persons, company, or parties interested in this Proposal or the Contract to be entered into, as Principals, are named herein; and this Proposal is made without connection with any other person, company, or parties making a bid or proposal; and that it is, in all respects, fair and in good faith without collusion or fraud.

The full names and addresses of persons or parties interested in the foregoing bid, as Principals, are as follows:

W. L. CAREY
P. O. Box 441
Royston, GA

Dated at Athens, Georgia

the 20th day of November, 19 80.

W. L. CAREY, GENERAL CONTRACTOR, INC
Bidder

by W. L. Carey, President

______ L.S.

The Bidder proposes to furnish and has based his bid upon furnishing major equipment produced by the following:

Item No.	Equipment or Related Items	Manufacturer	Representative or Vendor
1.	Raw Water Pumps	Worthington	Halley-Edwards
2.	Traveling Water Screens	Crane-Demning Rex	Heyward
3.	Ball Valves	Pratt	Wickliffe
4.	Controls and Instrumentation	Data-Quip	Wickliffe
5.	Ball Valve Control Panels	System Control	Wickliffe
6.	Motor Control Center	G.E.	Dwight Oliver

SECTION BB

BID BOND:

KNOW ALL MEN BY THESE PRESENTS, that we W. L. CAREY, GENERAL CONTRACTOR, INC.

(hereinafter called the Principal) and GULF INSURANCE COMPANY

(hereinafter called the Surety) a Corporation chartered and existing under the laws of the State of Missouri with its principal offices in the City of Dallas, Texas and authorized to do business in the State of Georgia is held and firmly bound unto the Mayor and Council of the City of Athens, a municipal Corporation of Clarke County, Georgia, in the full and just sum of

Five Percent (5%) of Total Amount Bid Dollars ($)

good and lawful money of the United States of America, to be paid upon demand of the City of Athens, Georgia, to which payment well and truly be made, we bind ourselves, our heirs, executors, administrators, and assigns, jointly and severally and firmly by these presents.

WHEREAS, the Principal is about to submit, or has submitted, to the City of Athens, Georgia, a proposal for furnishing materials, labor and equipment to construct the Middle Oconee Raw Water Station for the said City of Athens, Georgia, Job No. 800024 more particularly mentioned, and

WHEREAS, the Principal desires to file this bond in accordance with law, in lieu of a certified bidder's check otherwise required to accompany this Proposal.

NOW THEREFORE, the conditions of this obligation are such that if the proposal be accepted, the Principal shall within ten (10) days after receipt of notification of the acceptance thereof, execute a contract in accordance with the Proposal and upon the terms, conditions and prices set forth therein, in the form and manner required by the City of Athens, Georgia; and execute a sufficient and satisfactory Contract Performance Bond and Payment Bond payable to the City of Athens, Georgia, each in an amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to said City of Athens, Georgia, then this obligation to be void; otherwise to be and remain in full force and virtue in law; and the Surety

shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid City of Athens, Georgia upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this 20th

day of November , 19 80 .

W. L. CAREY, GENERAL CONTRACTOR, INC.
Principal

By____________________________
W. L. Carey, President

GULF INSURANCE COMPANY
Surety

By____________________________
William L. Hix
Attorney In Fact

SECTION CC

CORPORATE CERTIFICATE:

I, Ruby S. Carey, certify that I am the Secretary of the corporation named as Contractor in the foregoing proposal; that W. L. Carey, who signed said proposal in behalf of the Contractor was then President of said corporation, that said proposal was duly signed for and in behalf of said corporation by authority of its Board of Directors, and is within the scope of its corporate powers; that said corporation is organized under the laws of the State of Georgia.

This 20th day of November, 19 80.

Ruby S. Carey

_______________ L.S.

(SEAL)

SECTION C1

CONTRACT:

THIS AGREEMENT made and entered into this __________ day of __________________, 19 81 , by and between the Mayor and Council of the City of Athens, Georgia (Party of the First Part, hereinafter called the Owner) and W. L. CAREY, GENERAL CONTRACTOR, INC.

____

(party of the Second Part, hereinafter called the Contractor).

WITNESSETH: That the said Contractor has agreed, and by these presents does agree with the said Owner, for the consideration herein mentioned in his Proposal and under the penalty expressed in Bonds hereto attached, to furnish all equipment, tools, materials, skill, and labor of every description necessary to carry out and complete in good, firm and substantial and workmanlike manner, and work specified, in strict conformity with the drawings and the specifications hereinafter set forth, which drawings and specifications together with the foregoing Proposal made by the Contractor, the Instructions to Bidders, General Conditions, Special Conditions, Specifications and this Agreement, shall all form essential parts of this and this Agreement. The work covered by this Agreement includes all work shown on plans and specifications and listed in the Proposal, to-wit:

CONSTRUCTION OF
MIDDLE OCONEE
RAW WATER STATION
JOB NO. 800024

The Contractor shall commence the work with adequate force and equipment on a date to be specified in the Notice to Proceed and shall complete the Work within the Contract Time of three hundred and sixty-five (365) consecutive calendar days from and including said date.

If said Work is not complete within the time stated above, the Contractor shall be liable and hereby agrees to pay to the Owner as liquidated damages and not as a penalty, the amount of two hundred and fifty dollars ($250.00) per calendar day for each and every day or part of a day thereafter that said Work remains substantially incomplete.

The Owner shall pay and the Contractor shall receive the prices stipulated in the Proposal hereto attached as full compensation for everything furnished and done by the Contract,

the Contract Price of One Million, Four Hundred and Fifty One Thousand, One Hundred and Ninety Seven & $\frac{\text{No}}{100}$ Dollars ($1,451,197.00)

(Based on the quantities shown in the Proposal), which sum shall be paid in the manner and terms specified in the Contract Documents, but before issuance of certificate of payments, if the Contractor shall not have submitted evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the Work have been paid, the Owner may withhold, in addition to the retained percentages, such amount or amounts as may be necessary to pay just claims for labor and services rendered and materials in and about the Work, and such amount or amounts withheld or retained may be applied by the Owner to the payment of such claims.

It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Surety Bonds hereto attached for its faithful performance, the First Party shall deem the surety or Sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the Second Party shall, at its expense, within five (5) days after the receipt of notice from the First Party so to do, furnish an additional bond or bonds in such form and amount, and with such Surety or Sureties as shall be satisfactory to the First Party. In such event no further payment to the Second Party shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the First Party.

This Contract, executed in quadruplicate, constitutes the full agreement between the parties, and the Contractor shall not sublet, assign, transfer, pledge, convey, sell or otherwise dispose of the whole or any part of this Contract or his right, title, or interest therein to any person, firm or corporation without the previous consent of the Owner in writing.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement in quadruplicate, on the date first mentioned above.

ATTEST:

MAYOR AND COUNCIL OF
THE CITY OF ATHENS, GEORGIA
Owner

J C Fowler

By Lauren M. Coile SEAL
Mayor, City of Athens, Georgia

ATTEST:

W. L. CAREY, GENERAL CONTRACTOR, INC.
Contractor

J. Benson Myers

By W L Carey SEAL

Title: President

APPROVED AS TO FORM:

BY:
Attorney for Owner

Executed in
Quadruplicate

______ of 4.

SECTION CPB

CONTRACT PERFORMANCE BOND:

KNOWN ALL MEN BY THESE PRESENTS: That we W. L. CAREY, GENERAL CONTRACTOR, INC.

(herein called the Principal) and GULF INSURANCE COMPANY

(herein called the Surety) are held and firmly bound unto the Mayor and Council of the City of Athens, Georgia, (hereinafter known as the Owner) for the use of said obligee and all persons doing work or furnishing skill, tools, machinery, supplies or material under or for the purpose of the contract hereinafter referred to in the full and just sum of One Million, Four Hundred and Fifty one Thousand, One Hundred and Ninety seven and No/100 Dollars ($ 1,451,197.00)

lawful money of the United States of America, to be paid to said City of Athens, Georgia, its successors, and assigns to which payment well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bound Principal has entered into a contract or contracts with the said Owner, bearing date of ____________ 19______ for furnishing material, labor and equipment to construct the Middle Oconee Raw Water Station for the City of Athens, Georgia, Job No. 800024 more particularly mentioned, and

WHEREAS, it was one of the conditions of the award by said Owner pursuant to which said Contract was entered into, that these presents shall be executed.

NOW THEREFORE: The conditions of this obligation are such that if the above bound Principal shall in all respects fully comply with the terms and conditions of said Contract and his obligation thereunder, including the Specification and Proposal, therein referred to and made a part thereof, and such alterations as may be made in said specifications as therein provided for, and including one year guarantee period from date of

final acceptance and shall indemnify and save harmless the City of Athens, Georgia against and from all costs, expenses, damages, injury or loss, to which the said Owner, may be subjected by reason of any wrong-doing, misconduct, want of care or skill, negligence, or default, including patent infringement, on part of said Principal, his agents or employees, in the execution or performance of said Contract, and shall promptly pay all just claims for damages, or injury to property and for all work done, or skill, tools, and machinery, supplies, labor, and materials furnished and debts incurred by said Principal in or about the construction or improvements contracted for this obligation to be void; otherwise, in full force and effect.

And the said Surety to this Bond, for value received, hereby stipulates and agrees that no change, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder or the specifications accompanying same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations or additions to the terms of the Contract or to the Work or to the Specifications.

This Bond shall be for the use of all persons doing work or furnishing skill, tools, machinery, or materials, under or for the purpose of this Contract, in accordance with the provisions of Section 23-1705 et. seq. of the Code of the State of Georgia, as amended by the Act approved February 27, 1956, and is intended to be and shall be construed to be a bond in compliance with the requirements thereof.

The life of this Bond extends through the life of the Contract including the sixty-day maintenance period, where applicable, and until one year after the final acceptance of the Work by the Engineer.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed in quadruplicate, this ________________ day of ______________________, 19 ____.

W. L. CAREY, GENERAL CONTRACTOR, INC.
Contractor

ATTEST:

J. Benson Myers By W L Carey

Title President

GULF INSURANCE COMPANY
Surety

ATTEST:

Margaret S. Meyer By William L Hix

Title ATTORNEY IN FACT

COUNTERSIGNED:

By William L Hix
Local Agent

Executed in
Quadruplicate

______ of 4.

SECTION PB

PAYMENT BOND:

KNOW ALL MEN BY THESE PRESENTS: That we W. L. CAREY, GENERAL CONTRACTOR, INC.

as Principal, and GULF INSURANCE COMPANY

as Surety, are held and firmly bound unto the Mayor and Council of the City of Athens, Georgia in the full sum of One Million, Four Hundred and Fifty one Thousand, One Hundred and Ninety seven and No/100 Dollars ($ 1,451,197.00).

for the use and protection of said City of Athens, Georgia and all subcontractors and all persons supplying labor, materials, and machinery and equipment for the performance of the work provided for in the contract hereinafter referred to, for the payment of which well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

WHEREAS, the above bound Principal has entered into a contract or contracts with the City of Athens, Georgia dated the ________________ day of ________________,19___, for furnishing material, labor and equipment to construct the Middle Oconee Raw Water Station for the City of Athens, Georgia, Job No. 800024 more particularly mentioned, and

WHEREAS, it was one of the conditions of the award by said Owner pursuant to which said Contract was entered into, that these presents shall be executed.

NOW THEREFORE, the conditions of this obligation are such that if the above bound Principal shall promptly pay all subcontractors and all other persons supplying labor, materials, machinery and equipment furnished for the performance of the Work provided for by said Contract and such alterations or additions as may be made therein or in the Drawings and Specifications, then this bond to be void; otherwise, of full force and effect, and

The Surety to this bond, for value received, agrees that no change, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder or the Specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations or additions to the terms of the Contract or the Work or to the specifications.

It is agreed that this bond is executed pursuant to and in accordance with the provisions of Sections 23-1705 et seq., of the Code of the State of Georgia, as amended by the Act approved February 27, 1956 and is intended to be and shall be construed to be a bond in compliance with the requirements thereof.

IN WITNESS WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed this ____________ day of ______________________, 19____.

W. L. CAREY, GENERAL CONTRACTOR,INC
Principal

ATTEST:

J. Benson Myers

By W L Carey L.S.

Title President

GULF INSURANCE COMPANY
Surety

ATTEST:

Margaret S. Meyers

By William L Hart L. S.

Title ATTORNEY IN FACT

COUNTERSIGNED:

By William L Hart
Local Agent

Executed in
Quadruplicate

______ of 4.

SECTION OA

OPINION OF ATTORNEY:

This is to certify that I have examined the attached Contract Documents, that after examination I am of the opinion that such documents conform to the laws of the State of Georgia that the execution of the construction Contract and the Contract Performance and Payment Bonds are in due and proper form, and that the representatives of the respective contracting parties have full power and authority to execute such construction Contract and Contract Performance Bonds on behalf of the respective contracting parties and that the foregoing agreements constitute valid and binding obligations on such parties.

Attorney for

City of Athens, Georgia

This, the 11 day of May, 1981.

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SECTION GC

GENERAL CONDITIONS:

01. DEFINITION OF TERMS:

a. Whenever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

"Owner" refers to the public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

"Engineer" or "Architect/Engineer" shall refer to Robert and Company Associates, the Engineer appointed by the Owner as representatives of the Owner, and to their properly authorized agents limited by the particular duties entrusted to them.

"Resident Inspector" or "Inspector" refers to the representatives of Robert and Company Associates, authorized to observe the construction of the project, whose decisions shall be subject to the approval of the Engineer.

"Contractor" or "General Contractor" shall mean the individual, firm or corporation undertaking the execution of the work under the terms of the Contract and acting through its agents or employees.

"Subcontractor" shall mean any individual, partnership, firm, corporation, or other entity who either maintains an employee or employees on the project site for the purpose of prosecuting the work of this Contract or provides materials worked to a special design according to the drawings and specifications of this Contract. Subcontractor shall not mean the General Contractor nor any entity who merely furnishes materials not worked to special design.

"Bidder" refers to any person, firm or corporation submitting a Proposal for the Work.

"Bonds" refers to bid, performance, payment, and other instruments of security furnished by the Contractor and his surety in accordance with the Contract Documents.

"Proposal" refers to the offer, bid, or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

"Contract" shall mean the written agreement between the Owner and the Contractor covering the Work to be performed. Other Contract Documents are attached to the Contract.

"Contract Documents" shall consist of Addenda, Advertisement for Bids, the Bonds, Certificates of Insurance, Change Order, Contract, Corporate Certificate, Drawings, General Conditions, General Requirements, (if any), Instructions to Bidders, Notice of Award, Notice to Proceed, Partnership Certificate, Special Conditions, and Technical Specifications. The intent of these documents is to include all materials, appliances, tools, labor, and services of every kind necessary for the proper execution of the work, and the terms and conditions of payment therefor. The Contract Document shall be considered as one, and whatever is called for by one of them shall be as binding as if called for by all.

"Contract Time" shall refer to the number of days stated in the Contract for the completion of the Work.

"Contract Price" shall refer to the total moneys payable to the Contractor under the Contract Documents.

"Change Order" refers to a written order to the Contractor signed by the Owner authorizing an addition, deletion, or revision in the Work, or an adjustment to the Contract Price or Contract Time, and issued after execution of the Contract.

"Field Order" refers to a written order issued by the Engineer which clarifies or interprets the Contract Documents.

"Notice of Award" refers to the written notice issued by the Owner to the apparent successful bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified, the Owner will execute and deliver the Contract to him.

"Notice To Proceed" refers to the written notice issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

"Specifications" refers to those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the Work. The Specifications generally consist of the General Requirements and Technical Specifications, as listed in the Table of Contents.

"Drawings" or "Plans" refers to those drawings which show the character and scope of the Work and include all drawings enumbered in the Index to Drawings and supplemental drawings, if any, identified elsewhere in the Contract Documents.

"Work" of the Contractor or Subcontractor shall include all labor, material, equipment, transportation, skill, tools, machinery and other equipment and things useful or necessary in order to complete the Contract.

"Shall" is mandatory; "may" is permissive.

02. APPLICABLE REQUIREMENTS:

a. The Work shall comply with the Contract Documents and with all applicable codes, laws and regulations of County, State or Federal agencies which may have cognizance of any part of the work. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted by appropriate modification. If the Contractor performs any work knowing it to be contrary to such codes, laws or regulations, and without such notice to the Engineer, he shall assume full responsibility therefor and shall bear all costs attributable thereto.

b. In addition to safety and health requirements specified elsewhere in the Contract Documents, the Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) (and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54)).

03. CONTRACT SECURITY:

a. The Contractor shall furnish a contract performance bond and a payment bond, each equal to one hundred percent (100%) of the contract price. Bonds given shall meet the requirements of Georgia Code Section 23-1705. The surety on each bond shall be a surety company satisfactory to the Owner, duly authorized to do business in the State of Georgia, shall be listed in the Department of the Treasury Circular 570, and shall have an underwriting limitation in excess of 100% of the bid amount.

04. NOTICE AND SERVICE THEREOF:

a. Any notice to any Contractor from the Owner or the Engineer relative to any part of this Contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted by registered mail, to the said Contractor at his last given address or delivered in person to said Contractor or his authorized representative on the work site.

05. SPECIFICATIONS:

a. The Specifications, the Drawings accompanying them, and the other Contract Documents, shall be supplementary to each other, and any material, workmanship, and/or service which may be in one, but not called for in the others, shall be as binding as if indicated, called for or implied by all.

b. The General Contractor will be held responsible to furnish all labor and materials necessary to complete the work as indicated by the Drawings and Specifications.

c. The General Contractor shall see to it that his work overlaps the work of all his Subcontractors on the job, and agrees to assume all responsibility for liability, workmanship and quality of material concerning any work done by said Subcontractor.

d. Each section or type of work is described separately in the Technical Specifications; however, should any item of material, equipment, work or combinations of such be required in one section, and not be described in that section and a similar item described in another section, that description shall apply regardless of the section under which it is described.

06. SPECIFICATIONS AND DRAWINGS TO BE SUPPLEMENTARY:

a. These Specifications and Drawings accompanying them are intended to describe and provide for a finished piece of work. They are intended to be supplementary, and what is called for by either shall be as binding as if called for by both.

b. The Contractor will understand that the Work herein described shall be complete in every detail, notwithstanding every item necessarily involved is not particularly mentioned and the Contractor shall be held responsible to provide all labor and material necessary for the completion of the indicated Work.

c. The Contractor shall, before the award of the Contract, report in writing to the Engineer any discrepancy which he may discover between the Drawings and the S pecifications. If the Contractor fails to call such discrepancy to the attention of the Engineer the subsequent decision of the Engineer as to which is correct shall be binding and final.

d. Should any error or inconsistency appear in the Drawings or the Specifications, the Contractor, before proceeding with the Work, shall make mention of the same to the Engineer for proper adjustment, and in no case shall he proceed with the Work in uncertainty.

07. PRESENT DOCUMENTS GOVERN:

a. The Contractor shall in no case claim a waiver of any specification requirements on the basis of previous approval of material or workmanship on other jobs of like nature or on the basis of what might be considered "standard" for material or workmanship in any particular location. The Contract Documents for this job shall govern the Work.

08. DRAWINGS:

a. The Drawings generally show work fully drawn out on only a portion of the drawings, the remainder in outline. The drawn out work must be understood as applying to other like or similar places.

b. Large scale or full size details will be furnished by the Engineer for work which, in their opinion, shall require such drawings and specifications, and as indicating additional work. Details shall be accurately followed, and any deviations therefrom shall be cause for the rejection of any work so executed.

c. All necessary dimensions are given on the Drawings and shall in all cases, except where a discrepancy occurs, be followed exactly.

d. The figures and notes on the Drawings, showing the indicated dimensions shall be used instead of scaling. No dimensions may be determined by scaling except the details drawn to a three inch scale or larger, and these only when dimensions are not specifically given.

09. CONTRACTOR'S SHOP DRAWINGS:

a. The preparation and submission of Shop Drawings shall be the responsibility of the Contractor.

b. Shop drawings to be furnished by the Contractor shall consist of such detailed drawings as may be required for the prosecution of the Work and are not included in the Drawings. Required Shop Drawings include all items listed in the Technical Specifications, and all such information as necessary to determine the suitability of items for their intended use, and compliance with the Contract Documents.

c. Shop drawings must be approved by the Engineer before the Work in question is performed. It is expressly understood, however, that approval by the Engineer of the Contractor's shop drawings does not relieve the Contractor of any responsibility for accuracy of dimensions and details. It is mutually agreed that the Contractor shall be responsible for agreement and conformity of his shop drawings with the Drawings and Specifications.

d. It is the responsibility of the Contractor to check all shop drawings before same are submitted to the Engineer for approval. The Contractor's attention is directed to the fact that the Engineer will not check shop drawings which have not previously been checked and approved by the Contractor.

e. Shop Drawings shall be submitted only by the Contractor who shall indicate by a signed stamp on the drawings that he has checked the shop drawings and that the work shown on them is in accordance with contract requirements and has been checked for dimensions and relationship with work of all other trades involved. Under no conditions shall shop drawings be submitted to the Engineer by any other than the Contractor.

f. The approval of such shop drawings by the Engineer shall not relieve the Contractor from responsibility for deviations from Drawings or the Specifications unless he has in writing called attention to such deviations, and the Engineer has approved the changes or deviations in writing at the time of submission, nor shall it relieve him from the responsibility for errors of any kind in shop drawings.

10. PUBLISHED SPECIFICATIONS:

a. When other published and generally available specifications are referred to any identified on the Drawings and in these Specifications, it shall mean the latest edition thereof, and they shall become a part of these Contract Documents.

11. INSTRUCTIONS, CHANGES, ETC.:

a. All changes, alterations or instructions in regard to any feature of the Work that differ from the Drawings and other Contract Documents must be approved in writing in all cases, and no verbal orders will be regarded as a basis for claims for extra work.

b. If the Contractor claims that any instruction by drawings or otherwise involve extra cost or an extension of time, he shall so notify the Engineer in writing within ten (10) days after the receipt of such instructions and in any event before proceeding to execute the Work. Therefore, the procedure shall be the same as that described in Changes In The Work. No such claim shall be valid unless made in accordance with the terms of this section.

c. No claims for extra cost will be considered based on an escalation of material prices throughout the period of the Contract.

d. No extra work is to be performed or any changes made that involves any extra cost until the Engineer has authorized the Contractor to proceed, in writing, except in an emergency endangering life or property. The procedures for additional payment shall be as set forth under Changes In The Work.

12. EXAMINATION OF WORK BY CONTRACTOR:

a. It is understood and agreed that the Contractor, has by careful examination, satisfied himself as to the nature and location of the Work, the conformation of the ground, the character quality and quantity of the facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work or the cost thereof under this Contract. No verbal agreement or conversation with any officer, agent or employee of the Owner or the Engineer, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations herein contained.

13. MATERIALS, SERVICES AND FACILITIES:

a. The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time specified. Failure of the Contractor to provide adequate equipment may result in the cancellation of the Contract as herein provided. The equipment to be used on the Work by the Contractor shall be sufficient size to meet the requirements of the Work and shall be such as to produce a satisfactory quality of work, all to be subject to the approval of the Engineer.

b. Materials and equipment shall be so stored and handled as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection. No product which has in any way become unfit for the intended purpose shall be incorporated into the Work.

c. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, cleaned and conditioned as directed by the manufacturer.

d. Materials, supplies and equipment to be incorporated into the Work shall be new and unused unless otherwise specifically stated in the Contract Documents. The source of supply for all such products shall be submitted to the Engineer, together with detailed descriptions thereof in the form of samples, shop drawings, tests or other means necessary to adequately describe the items proposed. If, after trial it is found that sources of supply, even though previously approved by the Engineer, have not furnished products meeting the intent of the Contract Documents, the Contractor shall thereafter furnish products from other approved sources, and shall remove completed work incorporating products which do not meet contract requirements.

e. Any work necessary to be performed after regular working hours, on Sundays or legal holidays, shall be performed without additional expense to the Owner.

f. Working hours will be between dawn and dusk, Monday through Friday; work outside these hours will be allowed only with written approval of the Owner.

g. The Contractor shall maintain an office with a telephone or other satisfactory means of contact.

14. "OR EQUAL" CLAUSE:

a. Whenever a material or article required is specified or shown on the Drawings by using the name of the proprietary product or of a particular manufacturer or vendor, it is intended to denote the quality standard of the article desired, but does not restrict Contractors to the specified brand, make or manufacturer so named. Any material or article which will perform adequately the duties imposed by the general design may be considered equal and satisfactory providing the material or article so proposed is of equal substance and function. The opinion of the Engineers shall be final and no substitute material or article shall be purchased or installed without their written approval.

15. INSPECTION AND TESTING OF MATERIALS:

a. Unless otherwise specifically provided for, the inspection and testing of materials and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the Engineer. Unless otherwise specifically provided, all material inspection and testing cost will be paid by the Contractor. The Contractor shall furnish evidence satisfactory to the Engineer that the material and finished articles have passed the required tests prior to the incorporation of such materials and finished articles in the Work.

16. INSPECTION OF WORK:

a. The Contractor shall, at all times, permit and facilitate inspection of the work by authorized representatives of the Owner, the Engineers and Public Authorities having jurisdiction in connection with the work of this Contract. The Engineers shall interpret and enforce the terms of the Contract Documents, inspect the quality of the work and make recommendations concerning payment for the acceptance of completed work. The presence of the Engineers or their representative at the site of the work shall not be construed to, in any manner, relieve the Contractor of his responsibility for strict compliance with the provisions of the Contract Documents.

17. AUTHORITY OF ENGINEER:

a. The Contractor shall perform all of the Work herein specified under the general direction, and to the entire satisfaction, approval and acceptance of the Engineer. The Engineer shall decide all questions relating to the character of the Work performed and as to whether the rate of progress is such that the Work will be completed within the time limit of the Contract. Questions as to the meaning of these Contract Documents and questions relating to design will be referred to the Engineer.

b. The approval of the Engineer of any materials, plants, equipment, drawings, or of any other items executed, or proposed by the Contractor, shall be construed only to constitute an approval of general design. Such approval shall not relieve the Contractor from the performance of the Work in accordance with the Contract Documents, or from any duty, obligations, performance guarantee, or other liability imposed upon him by the provisions of the Contract.

c. The responsibility of the Engineer during construction shall be to make periodic visits to the site to observe the progress and quality of the Work; he will not make continuous on-site inspections. He will not be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents. Any defects or deficiencies in the work of the Contract observed during such visits will immediately be brought to the attention of the Contractor. The Engineer shall have the authority to stop the Work, if necessary to assure proper execution, and to disapprove work as not conforming to design.

18. AUTHORITY AND DUTIES OF INSPECTORS:

a. Inspectors shall be authorized to inspect all work done and all materials furnished, including preparation, fabrication and manufacture of the materials to be used, but they shall not be authorized to alter or waive any requirements of the Drawings, Specifications, or other Contract Documents. The Inspector may reject materials or suspend the work until any question at issue can be referred to and decided by the Engineer. The responsibility of the Contractor is not lessened by the presence of the Inspector.

19. NO PERSONAL LIABILITY:

a. In carrying out any of the provisions of the Contract or in exercising any power or authority granted to him thereby, there shall be no personal liability upon the Engineer nor upon any officer or employee of the Owner, it being understood that in such matters, they act as the agent and representative of the Owner.

20. PROHIBITED INTERESTS:

a. No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exectise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

21. REJECTION OF WORK AND MATERIALS:

a. All materials and equipment furnished and all work done that is not in accordance with the Drawings of Specifications or that is defective will be rejected. All rejected materials, equipment or work shall be removed immediately. If rejected materials, equipment or work is not removed within forty-eight (48) hours from the date of letter of notification, the Engineer shall have the right and authority to stop the Contractor and his work immediately, and/or shall have the right to arrange for the removal of said rejected materials, equipment or work at the cost and expense of the Contractor. All rejected materials, equipment or work which conforms with the Drawings and Specifications at no additional cost to the Owner.

b. Inspection of the Work shall not relieve the Contractor of any of his obligations to fulfill his contract and defective work shall be made good regardless of whether such work, material or equipment has been previously inspected by the Engineer and accepted or estimated for payment. The failure of the Engineer to condemn improper materials or workmanship shall not be considered as a waiver of any defect which may be discovered later, or for work actually defective. All work, material and/or equipment shall be guaranteed against defects for a period of one year from date of project acceptance as established by the Engineer.

22. DISAGREEMENTS:

a. Should any disagreement or difference arise as to the estimate, quantities or classifications or as to the meaning of the Drawings or other Contract Documents, or any materials and construction thereof, the decisions of the Engineer shall be final and conclusive and binding upon all parties to the Contract.

23. WEATHER CONDITIONS:

a. In the event of temporary suspension of Work, or during inclement weather, or whenever the Engineer shall direct, the Contractor will be required to protect all Work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or materials shall have been damaged or injured by reason of failure to protect such, all such materials or work shall be removed and replaced at the expense of the Contractor.

24. ROYALTIES AND PATENTS:

A. The Contractor shall hold and save the Owner and its officers, agents, servants and employees, harmless from liaility of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

25. CONTRACTOR"S PERSONNEL:

a. An experienced superintendent and necessary assistants competent to supervise the particular types of work involved shall be assigned to the project by the Contractor, and shall be available at all times when work is in progress. The name of the superintendent shall be submitted with qualifications of same prior to start of the work and shall be approved by the Engineer prior to start of the Work. The superintendent so named by the Contractor shall be employed by the Contractor and shall have served in a supervisory capacity on at least one project of like description and size performed by the Contractor during the previous twelve months. Under no circumstances shall an employee of any subcontractor serve as project superintendent. The superintendent shall represent the Contractor, and all directions given to the superintendent shall be as binding as if given to the Contractor.

b. Only persons skilled in the type of work which they are to perform shall be employed. The Contractor shall, at all times, maintain discipline and good order among his employees, and shall not employ on the Work any unfit person or persons or anyone unskilled in the work assigned him. The Contractor shall discharge, at once, from his services voluntarily or when required by the Engineer, any disorderly, dangerous, insubordinate or incompetent person employed on the Work and shall not again employ said person on this project.

26. LINES, GRADES AND MEASUREMENTS:

a. The Engineers will set sufficient base lines, indicated datum level, and the dimensions on the plans and shall be responsible for all of his grades. He shall check carefully all dimensions before starting any work and report to the Engineers any discrepancies for correction.

b. The Contractor shall be responsible for the preservation of all lines, points and elevations furnished and shall bear the expense of resetting same, if through carelessness or negligence they are destroyed.

27. PERMITS AND LICENSES:

a. Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor. Permits, licenses, easements and land for permanent structures or permanent changes in existing facilities will be secured and paid for by the Owner, unless otherwise specified.

28. LAWS AND REGULATIONS:

a. The Contractor's attention is directed to the fact that all applicable Federal, State and County laws, municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract Documents the same as though herein written out in full. The Contractor shall keep himself fully informed of all laws, ordinances and regulations of the Federal, State, and County in any manner affecting those engaged or employed in the Work or the materials used in the Work or in any way affecting the conduct of the Work and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in this Contract, or in the Drawings or other Contract Documents herein referred to, in relation to any such law, regulation, ordinance, order or decree, he shall herewith report the same, in writing, to the Engineer. He shall at all times himself observe and comply with all such laws, ordinances and regulations, and shall protect and indemnify the Owner and its agents against any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

29. CONTRACTOR'S OBLIGATIONS:

a. The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the Work required by this Contract, within the time herein specified, in accordance with the provisions of this Contract, the Drawings, and other Contract Documents, and in accordance with the Work covered by this Contract and any and all supplemental drawings of the Work covered by this Contract and in accordance with the directions of the Engineer as given from time to time during the progress of the Work. He shall furnish, erect, maintain, and remove such construction, plant and such temporary works as may be required. He alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or oepration. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of the Contract Documents, local ordinances, and State and Federal laws; and shall do, carry on, and complete the entire Work to the satisfaction of the Engineer and the Owner.

30. SUBCONTRACTING:

a. The Contractor shall not subcontract the complete Work, or any portion thereof, without prior written approval of the Engineer.

b. The Contractor shall be as fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

c. Nothing contained in this Contract shall create any contractual relation between any Subcontractor and the Owner.

31. ASSIGNMENTS:

a. The Contractor shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject ot prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Contract.

32. OTHER CONTRACTS:

a. The Owner may award other contracts for additional work and the Contractor shall fully cooperate with such other contractors and carefully fit his own work to that provided under other contracts as may be directed by the Engineer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor.

33. MUTUAL RESPONSIBILITY OF CONTRACTORS:

a. If, through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the Work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

34. CONTRACTOR'S HOLD HARMLESS AGREEMENT - INSURANCE:

a. The General Contractor shall be responsible from the time of signing the Contract, or from the time of the beginning of the first work, whichever shall be the earlier, for all injury or damage of any kind resulting from this work, to persons or property. The Contractor shall exonerate, indemnify and save harmless the Owner and the Engineer from and against all claims or actions, and all expenses incidental to the defense of any such claims, litigation and actions, based upon or arising out of damage or injury (including death) to persons or property caused by or sustained in connection with the performance of this Contract or by conditions created thereby or arising out of or any way connected with work performed under this Contract and shall assume and pay for, without cost to the Owner or the Engineer, the defense of any and all claims, litigations and actions, suffered through any act or omission of the Contractor or anyone directly or indirectly employed under the supervision of any of them.

b. The Contractor shall obtain, maintain, and furnish the following along with Bonds and other Contract Documents sent to the Owner for execution:

1. Certificates of Insurance from licensed companies doing business in the State of Georgia and acceptable to the Owner covering:

    a. Statutory Workmen Compensation Insurance;

    b. Comprehensive Liability Insurance covering all operations and automobiles:

    With limits of $1,000,000/$3,000,000 Bodily Injury inclusive of protection against bodily injury due to excavation, shoring, underpinning, and blasting, to the extent to which such risks are present.

    With limit of $1,000,000 Property Damage, inclusive of protection against damage due to excavation, shoring, underpinning and blasting, to the extent to which such risks are present.

2. Certificates of Insurance must be executed in accordance with the following provisions:

    a. Certificates to contain policy number, policy limits and policy expiration date of all policies issued in accordance with this Contract;

    b. Certificates to contain the location and operations to which the insurance applies;

    c. Certificates to contain specific statement that blasting coverage is included to the extent to which such risk is present;

    d. Certificates to contain Contractor's protective coverage for any Subcontractor's operations;

e. Certificates to contain the following clause:

"Re: Change or cancellation: Policies certified will not be changed or cancelled without ten (10) days prior notice to the Owner and the Engineer, as evidenced by return receipts of registered or certified letters."

f. Certificates to contain endorsement incorporating Hold Harmless Agreement assumed by Contractor as follows:

On the front of the certificate, the certificate to contain the following clause:

"Re: Indemnification Agreement: Contract liability is included. See Indemnification Agreement clause on the reverse side of certificate."

On the reverse of the certificate, Hold Harmless Agreement as specified under 34a.

3. The Contractor shall be wholly responsible for securing certificates of insurance coverage as set forth in 34a for all Subcontractors who are engaged in this Work.

4. The Contractor agrees to carry statutory Workmen's Compensation Insurance and to have all Subcontractors likewise carry compensation insurance.

5. Builders Risk (Fire and Extended Coverage):

The Contractor shall purchase and maintain adequate fire and standard extended coverage insurance upon the project. The insurance shall provide protection at all times against loss by the Owner and Contractor until final acceptance of the entire project. This provision with respect to Builder's Risk Insurance shall in no way relieve the Contractor of his obligation of completing the work covered by the Contract.

35. SOCIAL SECURITY TAX:

a. The Contractor assumes and is liable specifically for all State and Federal so-called Payroll or Social Security Taxes and guarantees to hold the Owner harmless in every respect against same.

36. SALES TAX:

a. The Contractor assumes and is liable specifically for all State and Federal Sales and Use Taxes that may be in force at the time of the Award of the Contract, except taxes from which the Owner may be exempt.

37. LAND AND RIGHTS-OF-WAY:

a. Prior to entering on any land or right-of-way, the Contractor shall ascertain the requirements of applicable permits or easements obtained by the Owner and shall conduct his work in accordance with requirements thereof including the giving of notice. The Contractor shall be fully responsible for performing work to the requirements of any permit or easement granting entity even though such requirements may exceed or be more stringent than that otherwise required by the Contract Documents, and shall compensate the Owner fully for any loss or expense arising from failure of the Contractor to perform as required by such entity.

b. The Contractor shall provide at his own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

38. ESTIMATE OF QUANTITIES:

a. The estimated quantities of Work to be done and materials to be furnished under this Contract if shown in any of the documents including the Proposal, are given only for use in comparing bids and to indicate approxiamtely the total amount of the Contract; and the right is especially reserved as except herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the Work contemplated by this Contract, and such increase or diminution shall, in no way, vitiate this Contract, nor shall any such increase or diminution give cause for claims or liability for damages.

39. USE OF PREMISES:

a. The Contractor shall confine his apparatus, the storage of materials, and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Engineer and shall not unreasonably encumber the premises with his materials. The Contractor shall not load or permit any part of the Work to be loaded with a weight that will endanger its safety. The Contractor shall enforce the Owners instructions regarding signs, advertisements, fires and smoking.

40. PROTECTION OF WORK, PROPERTY AND PERSONS:

a. The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, lakes, drainage ways, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of contruction.

b. The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the Work may affect them. The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable solely to the fault of the Contract Documents or solely to the acts or omissions or the Owner or anyone employed by them and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

c. If existing utilities or structures are indicated by the Contract Documents, no warranty is made as to the accuracy or completeness of such indication. The Contractor shall, prior to commencing other on-site work, accurately locate above and below ground utilities and structures which may be affected by the Work, using whatever means may be appropriate. The Contractor shall mark the location of existing utilities and structures, not otherwise readily visible, with flagging, stakes, barricades, or other suitable means, and shall preserve and protect all utilities and structures not designated for removal, relocation or replacement in the course of construction. He shall notify the Engineer promptly on discovery of any conflict between the Contract Documents and any existing facility.

d. In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special insturction or authorization from the Engineer shall act to prevent threatened damage, injury or loss. He will give the Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Engineer for review. The amount of reimbursement claimed by the Contractor and approved by the Engineer on account of any emergency action shall be determined in the manner prescribed for Changes In The Work, and a Change Order shall thereupon be issued covering such claim.

41. CONTRACTOR'S RESPONSIBILITY FOR WORK:

a. All Work under this Contract shall be under the care of the Contractor and he shall take every necessary precaution against injury or damage to the same, until final written acceptance is received from the Engineer. The Contractor shall rebuild, repair, restore and make good, at his own expense, all damages or injury occasioned by the action of elements, or any other cause whatsoever, before its final completion or acceptance.

42. PRIOR USE BY OWNER:

a. Prior to completion of the Work, the Owner may take over operation and/or use of the incompleted project or portions thereof. Such prior use of facilities by the Owner shall not be deemed as acceptance of any Work or relieve the Contractor from any of the requirements of the Contract Documents.

43. CLEANING UP:

a. The Contractor shall clean up and remove accumulated dirt at such times as he may be directed to do so by the Engineer and he shall remove, at his own expense, from the Work and from the adjoining property all rubbish and surplus materials resulting from his operations, which may have accumulated during the process of the Work, and leave the Work in a neat and orderly condition upon completion. Clean up work shall include the removal of stumps, tree trunks, limbs and surplus rock from the job site, removal of all barricades and warning signs, and final dressing by bringing earth to original grade and seeding or sodding as required.

b. Failure to follow the Engineer's written directions as to cleaning up at any time within twenty-four hours after such directions are given, shall thereupon give the Owner the right to clean up at the expense of the Contractor.

44. BARRICADES AND WARNING SIGNS:

a. The Contractor shall provide, erect, maintain and finally remove all barricades and detour signs necessary to properly protect and divert traffic. Such barricades and signs shall be illuminated at night. The Contractor will be held responsible for all damage to the Work due to failure of the signs and barricades to properly protect the Work from traffic, pedestrians, animals and from all other sources. The Contractor will also be held responsible for damage to persons or property due to failure to erect and maintain adequate barricades and signs. The construction of all barricades shall be such as acceptable to the Engineer and affected agencies having control over traffic.

45. TRAFFIC UNDER CONSTRUCTION:

a. The Contractor shall expedite his work so as to interfere as little as possible with the traffic along and across the street and at entrances to property.

b. Where construction is within existing highway, street or road right-of-way, the Contractor shall determine the exact traffic control requirements of the state, county or city authority having jurisdiction over the right-of-way and shall provide, operate and maintain all signs, barricades, lights and flagmen required by the authority.

46. MAINTENANCE OF SERVICE:

a. All existing utilities, both public and private, including sewer, gas, water, electrical and telephone services, etc., shall be protected and their operation shall be maintained throughout the course of the Work. Any temporary shutdown of existing service shall be arranged between the Contractor and the responsible agency. The Contractor shall assume full responsibility and hold the Owner harmless from the result of any damage that may occur as a result of the Contractor's activities.

47. CHANGES IN THE WORK:

a. The Owner may order extra work, or make changes by altering, adding to, or deducting from the Work, the Contract sum being adjusted accordingly. All such orders and adjustments shall be in writing in the form of a Change Order. All such work shall be executed under the conditions of the original Contract, except that any claim for the extension of the time caused thereby shall be adjusted at the time of ordering such a change.

Upon receipt of a fully executed Change Order, the Contractor shall proceed with the Work involved.

b. The Engineer shall have the authority to make minor changes in the Work, not involving extra cost and not inconsistent with the purpose of the Work. These changes may be accomplished by means of a Field Order. If the Contractor believes that any minor change or alteration authorized by the Engineers entitles the Contractor to an increase in the Contract Price or an extension of the Contract Time, he may make a claim therefor as provided in Instruction, Changes, Etc.

c. Additional work performed by the Contractor, without authoriazation of a Change Order, will not entitle the Contractor to a change in the Contract Price or the Contract Time, except in the case of an emergency endangering life or property.

d. The value of any extra work or change which cannot be adjusted by an increase or decrease in Contract unit items shall be determined in one or more of the following ways:

1. By estimate and acceptance in a lump sum;

2. The actual cost, by keeping a correct account, including all vouchers, for:

    a. The actual payroll costs of all workmen, including foremen;

    b. The Contractor's net cost for materials entering permanently into the Work;

    c. The ownership or rental cost of construction plant and equipment during period of actual use of the extra work;

    d. The charges for extra power and consumable supplies;

    e. The pro rata charges for insurance covering Public Liability, Workmen's Compensation, Old Age and Unemployment and Social Security;

    f. To the cost of items enumerated above shall be added a fixed fee for combined overhead and profit, not to exceed fifteen percent of the enumerated items except that actual cost only will be allowed for social security, old age and unemployment insurance. The allowance for combined overhead and profit so calculated shall be the only such allowance included in the total cost to the owner. Among the items considered as overhead are costs for insurance other than above, bond, superintendence, time keeping, clerical work, watchman, use of small tools, general office expense and miscellaneous.

48. TIME FOR COMPLETION AND LIQUIDATED DAMAGES:

a. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning, rate of progress and the Contract Time are essential conditions of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the Notice To Proceed.

b. The Contractor agrees that said Work shall be prosecuted regularly, diligently and uninterrupted at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the Contract Time described herein is a reasonable time for the completion of the Work, taking into consideration the average climate range and usual industrial conditions prevailing in this locality.

c. If the said Contractor shall neglect, fail or refuse to complete the Work within the time herein specified, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner, the amount specified in the Special Conditions, not as a penalty, but as liquidated damages, for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the Work.

d. The said amount is fixed and agreed upon by and between the Contractor and the Owner, because of the impracticability and extreme difficulty to fixing and ascertaining the actual damages, the Owner would, in such event, sustain and said amounts shall be retained from time to time by the Owner from current periodical estimates.

e. It is further agreed that time is of the essence of each and every portion of this Contract and of the other Contract Documents wherein a definite portion and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be the essence of this Contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is due:

1. To any preference, priority or allocation order duly issued by the Government;

2. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or the public enemy, acts of the Owner, acts of another contractor in the performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; and

3. To any delays of Subcontractors occasioned by any of the causes specified in subsections 1 and 2 above.

f. Provided further, that the Contractor shall within ten (10) days from the beginning of such delay, notify the Engineer, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

49. PAYMENTS BY CONTRACTOR:

a. The Contractor shall furnish the Owner, whenever requested, with satisfactory evidence that all persons who have done work, or furnished materials under this agreement have been duly paid or satisfactorily secured. In case such evidence is not furnished aforesaid, such amounts as may be necessary to meet the claim of such unsatisfied person may be retained from monies due to the Contractor under this Contract, until the liabilities aforesaid shall be fully discharged.

50. PAYMENTS TO CONTRACTOR:

a. Contractor's Breakdown of Lump Sum Payment Items - The Contractor shall immediately after the Contract has been awarded, submit to the Engineer, breakdown showing estimates of all costs apportioned to the major elements of equipment, material and labor comprising the total work included under any of the lump sum items shown in the Proposal. These estimates as approved will serve as the basis for estimating of payments due on all progress estimates.

b. Monthly Progress Payments - The Owner shall make a monthly progress payment to the Contractor on the basis of a duly certified and approved estimate of work performed. To insure proper performance of this Contract, the Owner shall retain ten percent (10%) of the amount of each payment until final completion and acceptance of all work covered by this Contract.

c. Materials and Work Covered by Partial Payments - All materials and work covered by progress estimates shall, upon payment thereof, become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made, or the restoration of any damaged work, or the removal and replacement of any material or work which does not comply with the Contract Documents.

51. OWNER"S RIGHT TO WITHHOLD PAYMENTS:

a. The Owner, may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. defective work not remedied;
2. claims filed or reasonable evidence indicating probable filing of claims;
3. failure of the Contractor to make payments properly to Subcontractors or for material or labor;
4. a reasonable doubt that the Contract can be completed for the balance then unpaid;
5. failure to provide insurance, bonds, or an office with telephone or other satisfactory means of contact.

b. The Owner shall have the right to disburse and act as agent for the Contractor in disbursing such funds as have been withheld pursuant to this paragraph to the party or parties who are entitled to payment therefrom. The Owner will render to the Contractor a proper accounting of all such funds disbursed in behalf of the Contractor.

52. OWNER'S RIGHT TO SUSPEND OR TERMINATE WORK:

a. The Owner may, at any time and without cause suspend the work or any portion thereof for a period of not more than ninety (90) days or such further time as agreed upon by the Contractor, by written notice to the Contractor which shall fix the date on which work shall be resumed. The Contractor will resume that work on the date so fixed. The Contractor will be allowed an increase in the Contract Price or extension of the Contract Time, or both, directly attributable to any suspension.

b. If the Contractor is adjudged bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, of if he repeatedly fails to make prompt payments to Subcontractors or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction over the Work or if he disregards the authority of the Engineer, or if he otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and his surety a maximum of seven (7) days from delivery of a written notice, terminate the services of the Contractor and take possession of the project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract sum exceeds the direct and indirect costs of completing the Work including compensation for additional professional services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor will pay the difference to the Owner. Such costs incurred by the Owner will be determined by the Engineer and incorporated in a Change Order.

53. CONTRACTOR'S RIGHT TO TERMINATE CONTRACT:

a. Should the Work be stopped by any public authority for a period of ninety (90) days or more, through no fault of the Contractor, or should the Owner fail to pay the Contractor any payment within a reasonable length of time after the payment shall become due, the Contractor, upon seven (7) days written notice to the Owner, may stop work, or terminate the Contract and recover from the Owner payment for all work executed.

54. MEASUREMENT OF WORK:

a. Measurement of Work, where applicable for payment purposes, will be in accordance with the General Requirements Section of the Specifications.

b. No extra or customary measurement of any kind shall be allowed in measuring the Work under this Contract; only the actual lengths, areas, solid contents, weights or numbers, as required by the terms of this Contract shall be considered, and the lengths shall be measured on the center lines of the work, whether the same be straight or curved, unless otherwise provided in the General Requirements.

55. ACCEPTANCE OF WORK AND FINAL PAYMENT:

a. Before final acceptance of the Work and payment to the Contractor of the percentage retained by the Owner, the following requirements shall be complied with:

1. Final Inspection: Upon notice from the Contractor that his work is completed, the Engineer shall make a final inspection of the work, and shall notify the Contractor of all instances where his Work fails to comply with the Drawings and Specifications, as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the Work comply with the Drawings and Specifications.

2. Liens: Final acceptance of the Work will not be granted and retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and materials employed or used in the construction of the work under this Contract have been settled, and that no legal claims can be filed against the Owner for such labor or materials.

3. Final Estimate: When the work under this Contract is completed, a final estimate shall be submitted representing the original Contract sum plus or minus all Change Orders to the Contract. The final payment shall not be due until the Contractor shall have completed all work, necessary and reasonably incidental to the Contract, including final cleanup, and shall have delivered to the Owner a release of all liens arising out of the Contract, or receipts in full certifying complete payment for all materials and labor for which liens could be filed, or a bond acceptable to the Owner indemnifying the Owner against any lien.

4. Acceptance and Final Payment: All prior certificates or estimates upon which payments have been made shall be considered approximate only, and subject to correction in the final payment. The amount of the final estimate less the ten percent (10%) retained and less the sum of all prior payments will be paid to the Contractor within thirty (30) days after approval by the Engineer. The retained percentage will not be due or payable to the Contractor until after a sixty (60) day maintenance period, where applicable, during which time the Contractor will be required to maintain all work done by him in a first class manner.

b. Acceptance of the Work and the making of final payment shall not constitute waiver of any claims by the Owner. Payments otherwise due the Contractor may be withheld by the Owner because of defective work not remedied, liens filed, unadjusted damage to others by the Contractor or Subcontractors, vendors or laborers.

56. DEDUCTION FOR UNCORRECTED WORK:

a. If the Owner deems it expedient to accept Work injured or not done in accordance with the Contract, an equitable adjustment will be made with a proper deduction from the Contract price for unsatisfactory work.

57. GUARANTEE AND CORRECTION OF WORK:

a. The Contractor shall guarantee all Work to have been accomplished in conformance with the Contract Documents. Neither the final certificate of payment nor any provision of the Contract Documents, nor partial or entire occupancy or use of the Work by the Owner, shall constitute an acceptance of any part of the Work not done in accordance with the Contract Documents, or relieve the Contractor of liability for incomplete or faulty materials or workmanship. The Contractor shall promptly remedy any omission or defect in the Work and pay for any damage to other improvements or facilities resulting from such omission or defect which shall appear within a period of one (1) year from the date of final acceptance, unless a longer period is elsewhere specified. In the event that the Contractor should fail to make repairs, adjustments, or other remedy that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Contract Performance Bond shall remain in full force and effect through the guarantee period.

SECTION SC

SPECIAL CONDITIONS:

01. REFERENCE SPECIFICATIONS:

a. Publications, standards, and specifications referred to in the Technical Specifications form a part of the Contract Documents as if hereto attached.

b. Abbreviations used to identify reference specifications are as follows:

AASHO - American Association of State
Highway Officials
341 National Press Building
Washington, D. C. 20004

ASTM - American Society for Testing Materials
1916 Race Street
Philadelphia, PA. 19103

ANSI - American National Standards Institute, Inc.
1430 Broadway
New York, New York 10018

UL - Underwriters Laboratories, Inc.
207 East Ohio Street
Chicago, Illinois 60611

IEEE - Institute of Electrical and Electronic Engineers
345 East 47th Street
New York, New York 10017

NEMA - National Electrical Manufacturers Association
155 East 44th Street
New York, New York 10017

SMACCNA- Sheet Metal & Air Conditioning Contractors'
National Association, Inc.
1611 North Kent Street
Arlington, Virginia 22209

AISC - Americal Institute of Steel Construction
101 Park Avenue
New York, New York 10017

ACI - American Concrete Institute
Post Office Box 4754, Redford Station
Detroit, Michigan 48219

AWS - American Welding Society
33 West 39th Street
New York, New York 10017

PCA - Portland Cement Association
Old Orchard Road
Skokie, Illinois 60076

AVATI - Asphalt and Vinyl Asbestos Tile Institute
101 Park Avenue
New York, New York 10017

AMA - Accoustical Materials Association
335 East 45th Street
New York, New York 10017

PAP - American Plywood Association
1119 "A" Street
Tacoma, Washington 98401

TCA - Tile Council of America
Post Office Box 326
Princeton, New Jersey 08540

SJI - Steel Joist Institute
2001 Jefferson Davis Highway
Washington, D. C.

AWMA - Aluminum Window Manufacturers Association
75 West Street
New York, New York 10006

ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
345 East 47th Street
New York, New York 10017

SPIB - Southern Pine Inspection Bureau
Canal Building
New Orleans, Louisiana

AWWA - American Water Works Association
2 Park Avenue
New York, New York 10016

SHI - Standards of Hydraulic Institute
90 West Street
New York, New York 10006

ASME - American Society of Mechanical Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017

NFPA - National Fire Protection Association
60 Batterymarch Street
Boston, Massachusetts 02110

AMCA - Air Moving and Conditioning Association, Inc.
30 West University Drive
Arlington Heights, Illinois 60004

- Commercial Standards and National Bureau of Standards
Superintendent of Documents
U. S. Government PRINTING Office
Washington, D. C.

NWMA - National Woodwork Manufacturers Association
400 West Madison Street
Chicago, Illinois 60606

AAMA - Architectural Aluminum Manufacturers Association
35 East Wacker Drive
Chicago, Illinois 60601

NFPA - National Forest Products Association
Technical Services Division
1619 Massachusetts Avenue, N. W.
Washington, D. C. 20036

CRSI - Concrete Reinforcing Steel Institute

Addresses shown are for information only and may not be current.

02. CONTRACT DOCUMENTS FURNISHED:

a. Upon award and execution of the Contract the Contractor will be furnished without charge six (6) complete sets of Contract Documents. Additional copies may be obtained by the Contractor from the Engineer at cost.

03. USE OF CHEMICALS:

a. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

04. TEMPORARY TOILET ACCOMMODATIONS:

a. The Contractor shall provide for the use of his workmen ample sanitary toilet accommodations which meet with the local, county, and state Regulations. He shall keep such places in a sanitary condition, and prior to the completion of the Contract, he shall remove same, and restore the site as originally found.

05. EQUIPMENT AND MATERIALS:

a. All equipment and materials furnished shall comply with the Specifications and other requirements of the Contract Documents, unless deviations are specifically authorized by the Engineer.

b. Equipment and materials shall be of the highest quality and shall be recommended by the manufacturer for the specific application, and shall fit properly in the designated space, location, or installation without requiring modifications to structures or other equipment or work unless specifically approved by the Engineer. The manufacturer, vendor, or supplier of equipment or materials and the Contractor do certify compliance with the above by the act of submitting shop drawings or other submittals.

c. Any modifications approved by the Engineer and that are necessary to accommodate equipment or materials furnished will be accomplished by the Contractor without additional cost to the Owner. Any additional or revised design work required, to accommodate modifications for equipment or materials will be performed by the Engineer and all costs paid by the Contractor.

d. Where any specification requirement establishes a minimum experience record, manufacturers and/or equipment not meeting the specified experience period may be considered if the manufacturer or supplier provides a bond or cash deposit which will guarantee replacement of the equipment or process in the event of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be the same as the experience period of time specified.

06. SALES TAX:

a. Attention is directed to Act Number 173 (House Bill Number 478) of the Georgia General Assembly, approved April 1, 1967, relating to the "Georgia Retailer's and Consumer's Sales and Use Tax Act" approved February 20, 1951 (Georgia State Law 1951, p. 360).

b. Insofar as this Act is applicable, the Owner will obtain the necessary certification exempting machinery and equipment from the imposition of the Georgia Sales or Use Tax.

07. ENVIRONMENTAL PROTECTION:

a. During construction the Contractor shall provide rows of hay bales, and/or other preventive measures as may be required by governing laws or ordinances to prevent siltation and soil erosion.

b. All such work shall be done without additional cost to the Owner.

c. The Contractor will restore all disturbed areas to their present or better condition upon completion of construction.

08. NATIONAL SAFETY CODE PROVISIONS:

a. The Contractor shall be responsible for keeping the Engineer advised of any conflicts due to any provisions or changes in the safety code which affect the work as shown on the Drawings, and described in the Specifications. It shall be the Contractor's responsibility to observe all provisions of the National Safety Code, keeping current with changing requirements, in all phases of the Work at all times.

09. SAFETY AND HEALTH REGULATIONS:

a. In addition to safety and health requirements specified elsewhere in the Contract Documents, the Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Sec. 107 of the Contract Work Hours and Safety Standards Act (PL 91-54).

10. STATED ALLOWANCES:

a. The Contractor shall include in his Bid the cash allowances, if any, stated elsewhere in the Contract Documents.

b. The Contractor shall purchase "allowed materials as directed by the Engineer on the basis of the lowest and best bid of at least three competitive sources unless otherwise requested by the Engineer.

c. The Contractor shall employ the services of an independent testing laboratory, acceptable to the Engineer, to perform such testing and inspection services specifically identified elsewhere in the Contract Documents or additional services as determined by the Engineer and specifically identified as services to be paid for under the Stated Allowances provisions.

This testing and inspection is separate from and not to be confused with quality control testing to be provided by the Contractor.

d. If the actual price for purchasing allowed materials or services is more or less than the stated allowance, the Contract Price shall be adjusted accordingly. The adjustment in Contract Price shall be made on the basis of the purchase cost or the testing laboratory invoice, including applicable sales taxes, but exclusive of additional charges for overhead, profit, insurance or any other incidental expenses. Cost of installation of allowed materials shall be included in the Bid.

e. Include the following stated allowances:

1. Reimbursable testing laboratory services - One Thousand and Five Hundred Dollars ($1500.00).
2. Landscaping - Two Hundred Dollars ($200.00).
3. Hardware (as listed in Section 8a) - Two Hundred Dollars ($200.00).
4. Metal Plaque - Three Hundred Dollars ($300.00).

Total Stated Allowances - $2,200.00.

11. INDEX TO DRAWINGS:

a. The following list of Drawings which accompany and form a part of these contract documents, have been prepared by the Engineer, acting for the Owner. The Drawings or Plans referred to in the Contract Documents refer to the Drawings identified by the following:

b. Index to Drawings Entitled: Middle Oconee
Raw Water Station

For: City of Athens, Georgia

Job No. 800024

Sheet No.	Sheet Title	Dwg. No.	Date
GENERAL DRAWINGS			
1.	Cover Sheet	800024-G1	7-21-80
2.	Site Plan	800024-G2	7-21-80
3.	Operating Level Plan	800024-G3	7-21-80
4.	Plan and Details	800024-G4	7-21-80
5.	Elevations and Plans	800024-G5	7-21-80

Sheet No.	Sheet Title	Dwg. No.	Date
GENERAL DRAWINGS (Continued)			
6.	Sections - 1	800024-G6	7-21-80
7.	Sections - 2	800024-G7	7-21-80
8.	Architectural Details	800024-G8	7-21-80
9.	Miscellaneous Details	800024-G9	7-21-80
STRUCTURAL DRAWINGS			
10.	Plans - Elev. 558.0 - Elev. 575.50	800024-S1	7-21-80
11.	Plans - Operating Floor & Roof	800024-S2	7-21-80
12.	Building Sections	800024-S3	7-21-80
13.	Wall Sections & Details - 1	800024-S4	7-21-80
14.	Wall Sections & Details - 2	800024-S5	7-21-80
15.	Wall Sections & Details - 3	800024-S6	7-21-80
16.	Spillway Walls & Details	800024-S7	7-21-80
17.	Building Sections & Framing	800024-S8	7-21-80
18.	Building Framing & Details	800024-S9	7-21-80
19.	Miscellaneous Deatils	800024-S10	7-21-80
MECHANICAL DRAWINGS			
20.	Heating and Ventilation	800024-M1	7-21-80
ELECTRICAL DRAWINGS			
21.	Legend	800024-E1	7-21-80
22.	Part Plan Exist. Water Treatment Plant	800024-E2	7-21-80
23.	Site Plan - Area Lighting	800024-E4	7-21-80
24.	Single Line Diagrams	800024-E5	7-21-80
25.	MCC & Ball Valve Control Panels	800024-E5	7-21-80
26.	Power Layout	800024-E6	7-21-80
27.	Longitudinal Section - Power Layout	800024-E7	7-21-80
28.	Plan - Control Wiring Layout	800024-E8	7-21-80
29.	Motor and Ball Valve - Control Wiring	800024-E9	7-21-80
30.	Lighting Layout - Upper Level	800024-E10	7-21-80
31.	Receptacle & Heating Layout	800024-E11	7-21-80
32.	Lighting Layout - Lower Level	800024-E12	7-21-80
33.	Telemetry Details	800024-E13	7-21-80
34.	Area Lighting Details & Fixture Schedule	800024-E14	7-21-80
35.	Control Wiring Diagrams	800024-E15	7-21-80
36.	Motor Schedule	800024-E16	7-21-80

12. MAINTENANCE PERIOD:

a. A sixty (60) day maintenance period will be required. For sixty days from the date of final project acceptance, the Contractor shall fully maintain all work in proper operating condition. This includes all routine and special maintenance and necessary adjustments to equipment, as well as repair of defects or difficiencies discovered. During this time the Contractor shall fully instruct the Owner's personnel in the operation and maintenance of all equipment or products furnished. The extent of operation will be as required by the Owner.

b. The maintenance period is supplemental to and in addition to the guarantee period.

13. REFERENCE TO OWNER :

a. All references in the Contract Documents pertaining to the City of Athens, the City, etc., shall refer to the "Mayor and Council of the City of Athens," the official legal title of the Owner.

14. BONDS:

a. Where the Bonds are required to be countersigned by a local agent, an agent in either Athens or the Metropolitan Atlanta Area shall be acceptable.

SECTION 1G

GENERAL REQUIREMENTS:

01. SUMMARY OF PROJECT WORK:

a. Project work generally consists of construction of a 16 M.G.D. river water intake and pumping station and all related work identified by the Drawings, Specifications, and other Contract Documents. The work also includes remote telemetering to the existing Water Treatment Plant.

02. CONSTRUCTION SURVEYS:

a. The Owner will provide control surveys and construction staking to establish a base line at the project site and to establish a bench mark at the site. This survey will provide horizontal and vertical control for work constructed on this project.

Additional construction surveys for layout or other purposes will be performed by the Contractor. Any construction surveys performed for the purpose of measurement for payment will be provided by the Owner.

The Contractor shall make every effort to preserve all control survey monuments and other monuments as instructed by the Engineer, and shall reestablish any disturbed monuments as provided elsewhere in the Contract Documents.

03. EXISTING TOPOGRAPHY:

a. The Contractor shall examine the site and determine the actual topography as necessary for his purposes. No additional payment will be made due to deviations from the existing topography shown on the Drawings.

The location of finished contours will remain generally as located on the Drawings, unless otherwise modified in accordance with the provisions of the Contract Documents.

04. COORDINATION OF WORK:

a. The Contractor is responsible for coordinating the work with other Contractors on the general project site, protect the work of other contractors and repair any damage inflicted to other work in the course of performing project work. Make every attempt to schedule work so as to minimuze any conflict with other work in progress.

b. The Contractor must conduct all of his operations without interruption of traffic on the streets and on private property. Storage of materials and equipment on the project site shall be at locations that will not interfere with other activities and as approved by the Resident Inspector.

05. STRUCTURE LEAKAGE:

a. The Contractor is responsible for the watertightness of all structures. Allow no visible leakage into or out of any structure or portion of a structure. Waterholding structures will be tested for leakage by the Contractor by filling to maximum liquid level and pressure, and measuring the liquid loss. The measured leakage for any waterholding structure shall not exceed one percent of the total structure volume over a twenty-four hour period.

06. MAINTENANCE OF PLANT OPERATIONS:

a. The Contractor shall ocordinate all Work with the operating schedule of the existing plant personnel. Insofar as practicable the Contractor shall so schedule his operations and employ such methods of carrying out the Work that he will not cause any interruptions of, or interference with normal operation of the existing facility.

b. Should it become necessary to install temporary lines, temporary pumps, or other means for continuous operation, this shallbe done, operated, maintained and removed upon completion at no additional cost to the Owner.

c. Where any Work may require an interruption of service or interference in any way with plant operation, permission for such interruption must be obtained from the Engineer and the Work performed at such time as may be designated by him. The Contractor shall have no claim for extra compensation because of restrictions and limitations of Work required by the Engineer.

07. MAINTENANCE OF OPERATION AND SERVICES:

a. No utility (water, sewer, gas, telephone, electric, etc.) service shall be interrupted without the permission of the utility owner. Where any of the work may require an interruption of service, permission for such interruption must be obtained from the Superintendent of the Water and Sewer

Department or from a responsible official of affected utility and the work shall be performed in accordance with and at such time as may be designated by the utility owner. No extra compensation will be allowed the Contractor because of requirements, restrictions or limitations of work that may be required by the utility owner.

b. Tapping, plugging and connecting to existing water mains shall be done during periods of low demand and shall be performed at night, on week-ends or other times designated by the Owner. The Owner will cooperate with the Contractor in every way possible to insure that the work is completed on schedule. The number of shutdowns for connecting new work shall be kept to a minimum.

08. OBSTRUCTIONS:

a. Obstructions and improvements shown on the Drawings are for the convenience of the Contractor and no guarantee is made of the accuracy or completeness of the obstructions and improvements shown.

b. The Contractor shall verify these in the field and provide for all obstructions encountered and shall use utmost caution in all operations to avoid damage to existing pipes, sewers, conduits, cables, pole lines, structures, etc., whether or not shown on the Drawings. Any damage to existing structures or utilities shall be repaired or made good by the Contractor at no expense to the Owner.

c. The Owner will obtain the necessary easements and permits for construction across public and private property, streets, railroads, telephone lines, power lines, etc. The Contractor shall abide by all rules, regulations, and requirements of the Owner of such property in regard to the construction under this Contract, including the giving of notices, provisions for inspection, and employment of such methods of construction as may be required. Wherever additional costs are incurred due to such requirements, all such costs shall be included in the prices bid. No additional compensation will be allowed for such costs after award of the Contract.

d. The intent of the Contract Documents is for the Contractor to be entirely responsible for all obstructions, regardless of whether or not shown on the Drawings. Any obstructions encountered at any time and in any location shall be provided for in the most practical manner. Utilities and all plant operating procedures shall be kept in operation. Should it become necessary to install temporary lines, temporary pumps, or other means for the continuous operation of utilities, and plant operation, when interruption of any utility service or phase of plant operation is required in order to permit connection of Work under this Contract to existing systems, arrangement for these interruptions shall be at times and for the duration approved by the Engineer in writing. All of this work shall be done, maintained, operated, and removed upon completion at no additional cost to the Owner. No trees are to be removed or severely pruned outside of the actual construction area, except as approved by the Owner.

09. MATERIALS:

a. All materials, unless otherwise specified, will be furnished new and installed by the Contractor.

b. Except as otherwise specified and/or indicated on the Drawings all materials to be removed shall be the property of the Contractor and shall be removed from the Owner's property by the Contractor.

c. All material specified to remain the property of the Owner shall be cleaned and stored on the site, by the Contractor, as directed by the Engineer.

10. CONSTRUCTION PHOTOGRAPHS:

a. Beginning with the first month of construction the Contractor shall furnish four (4) progress photographs each month until completion of the project. Photographs shall be 8" x 10" in size. One (1) print of each photograph shall be delivered to the Engineer the first week of each month.

b. Photographs shall be taken from various locations where directed by the Engineer.

c. The following information shall be typed on a label attached to the back of each photograph:

1. Middle Oconee Raw Water Station - Athens, Georgia.
2. Date photograph was taken.
3. Location of photograph including view shown.

11. SHORING:

a. The Contractor shall provide all permanent and temporary piling, shoring, anchoring guy wire, and bracing reasonably required by the nature of his work, in order to make all parts absolutely stable and rigid, even when such piling, shoring, anchoring and bracing are not explicitly called for. He will be held strictly accountable for any damage resulting from failures to provide it, either through lack of proper judgment or for any other cause.

12. PROPERTY CONFINES:

a. The Contractor has no authority to permit the use of any portion of the premises by anyone, except for business connected with the construction in which this Contract is concerned.

13. STORAGE OF APPARATUS AND MATERIALS:

a. All equipment and materials shall be stored in such a manner as to insure the preservation of their quality and fitness for the work. Materials stored shall be located so as to facilitate prompt inspection and shall be confined to space designated by the Resident Inspector.

b. All such materials shall be stored so as not to interfere with the use of fire hydrants or construction facilities.

c. Should it become necessary at any time during the progress of the whole project to move materials which have been temporarily placed previous to their use in the construction, the Contractor shall, when so directed by the Engineers, move them without additional cost to the Owner.

d. The Contractor shall be responsible for all damage from unloading, handling and/or placing.

14. SALVAGED MATERIAL AND EQUIPMENT:

a. All material and equipment required to be removed and not reused in the new work, which are at salvage quality shall remain the property of the Owner and shall be stored by the Contractor at the Owner's storage yard and in the manner directed by the Engineers. When equipment or material removed is refused by the Owner, it shall become the property of the Contractor, and shall be removed from the site.

15. SUBMITTALS:

A. Submit six (6) copies of all shop drawings and other submittals which have been checked and stamped and approved by the Contractor for review by the Engineer. After review, the submittals will be marked by the Engineer as follows:

Not Approved: Submission does not comply with Contract Documents. Resubmit complying with Contract Documents.

Returned for Correction: Does not give authority to proceed with any portion of the work shown thereon.

Approved as Noted: Gives authority to proceed with fabrication in accordance with notations but corrected prints must be resubmitted for final approval; does not give authority to ship and/or erect any portion of the work shown thereon or any other contingent work dependent thereon.

Approved: Gives authority to proceed with the work as shown; a copy of which shall be kept on file at the Contractor's field office.

b. Three marked copies of submittals will be returned to the Contractor.

16. AS-BUILT DOCUMENTS:

a. Field Record Documents consisting of one bound copy of Specifications; one copy of each Addendum, one copy of each Supplement, and one bound set of the Drawings, shall be kept in the Contractor's field office at all times. The Field Record Drawings shall be reserved solely for recording:

Changes in the Work incorporated by Addendum, accepted Alternate, or Supplements; and

The exact location, dimension, function, and manufacturer's designation of all concealed elements of structural, mechanical, electrical, or other building system as actually installed, including new and/or existing underground utility lines and their offsets.

b. Data shall be transferred to the Field Record Drawings promptly, neatly, and legibly and shall be keyed to appropriate shop drawings. Supplementary drawings shall be prepared by the Contractor, if required for clarity, and attached as part of the Field Record Drawings. Care shall be exercised in handling and storing the Field Record Documents to avoid destruction of recorded data.

c. Field Record Documents shall be turned over to the Engineer at project completion.

d. Maintenance Manuals: Furnish six sets of operating and maintenance manuals or instructions for each major item of equipment, system or sub-system furnished. The operating and maintenance manuals shall include recommended spare parts lists. Submit Maintenance Manuals to the Engineer not later than 75 percent Project completion, unless otherwise approved by the Engineer in writing.

17. TESTING LABORATORY SERVICES:

a. The Contractor shall employ the services of a qualified independent testing laboratory acceptable to the Engineer. The testing laboratory will perform all material testing required by the Contract Documents and additional testing as required by the Contract Documents and additional testing as required by the Engineer, as necessary, to determine compliance with the Specifications.

b. All costs for testing will be paid by the Contractor.

c. Invoices for laboratory services will be billed by the laboratory to the Contractor and transmitted through the Engineer. The Contractor shall pay such invoices when received with the approval of the Engineer noted thereon.

d. The Contractor will be reimbursed for certain laboratory services in accordance with the Stated Allowance Provisions of the Special Conditions. Reimbursable testing costs are limited to the following:

1. Initial testing of concrete cylinders and compaction tests.
2. Additional material tests required by the Engineer which indicate results complying with the Specifications.

e. Laboratory services not eligible for reimbursement include the following:

1. Preparation and verification of concrete mix designs.
2. Preparation of moisture-density curves for earthwork.
3. Retests where initial tests failed.
4. Sampling and making test cylinders and transportation to the laboratory.
5. Costs of concrete coring.
6. Other testing required by the Contract Documents and not specified for reimbursement.

f. The estimated cost for reimbursable testing laboratory services is included in the Contract Price in accordance with the Stated Allowance provisions of the Contract Documents, and the stated amount stipulated will be increased or decreased as required to equal the actual reimbursable cost.

18. RIGHTS-OF-WAY AND SUSPENSION OF WORK:

a. All lands and right-of-way will be acquired by the Owner prior to the award of any construction contract upon which the work called for in the Contract is to be done. No complications are anticipated in obtaining the easements or right-of-way; however, should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of his inability to procure any lands or rights-of-way for the said work, the Contractor shall not be entitled to make or assert any claim for damage by reason of said delay, or to withdraw from the Contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.

19. MEASUREMENT AND PAYMENT::

a. Only those pay items identified on the Proposal or added by Addendum or Change Order to the Contract, will be measured for payment and paid for at the bid unit prices.

b. The cost of all work not directly covered by the pay items is considered to be included and distributed pro rata among the bid amount prices of the pay items listed on the Proposal form.

c. Adjustment Unit Prices:

1. Rock Excavation will be measured for payment on the basis of actual cubic yards (C.Y.) of rock excavated. The volume of rock will be measured in the excavation by field survey of the top of rock in the excavation, as visible in the sides of the excavation, after rock removal. The depth of rock will extend from top of rock to one foot below structural foundations or finish grade as applicable. Measurement of rock excavated in conjunction with structure excavation will be based on the horizontal area computed from the dimensions of the structure plus ten (10) feet of space on each side of the structure. Measurement of rock excavated in conjunction with pipework will be based on the nominal diameter of the pipe plus one foot of trench width. Measurement of rock excavated for grading purposes will be based on the actual plan area of rock,

surveyed at approximately fifty-foot intervals. Additional rock excavated will be for the convenience of the Contractor and will not be measured for payment.

Payment for rock excavation will be made for the computed volume of rock excavated at the adjustment unit price listed on the Proposal form. Only material complying with the definition of rock, as stated elsewhere in the Contract Documents, will be measured for payment.

Payment for rock excavation shall be full compensation for excavation of rock and removal from the site or other disposal means as acceptable to the Engineer. Payment will be made in addition to other items listed on the Proposal form.

2. Reinforced Concrete will be measured for payment on the basis of actual cubic yards (C. Y.), as computed from the required dimensions of the finish concrete. Additional concrete used will be for the convenience of the Contractor and will not be measured for payment. Payment will be irrespective of the class of concrete or reinforcing.

Only concrete work added or deleted from the Contract will be measured for payment. The total adjustment amount for reinforced concrete will be based on the total volume of reinforced concrete added or deleted from the Contract at the unit price listed on the Proposal form. The Contract Price will then be increased or decreased by that amount.

Payment for reinforced concrete shall be full compensation for constructing reinforced concrete work complete, in place, including excavation, forming, furnishing and placing reinforcing and concrete, finishing, curing, form removal, rubbing, backfill, and other related work.

d. The retainage, as specified in the General Conditions, is based on the total amount due the Contractor, for both completed work and approved stored materials. Any work or stored material found not to be in compliance with the Contract Documents will not be elibible for payment. The Owner may elect to reduce the retainage to five percent (5%) once the work is more than fifty percent complete; however, the Owner is under no obligation to do so.

20. PRECONSTRUCTION CONFERENCE:

a. After execution of the Contract and prior to the Notice to Proceed, a preconstruction conference will be scheduled, and attended by the Owner, and/or the Engineer, and the Contractor. At that time, procedures for processing submittals and payment requests will be established. The Contractor will be notified as to the time and place of the conference.

21. PAYMENT REQUESTS:

a. Payment requests shall be prepared by the Contractor on a standard form acceptable to the Engineer. The Contractor shall submit copies of payment requests to the Resident Inspector for review of the quantities. The Resident Inspector, after reviewing, will forward the forms to the Engineer, who may make corrections and either forward to the Owner for payment, or return to the Contractor for correction and resubmission. Approved payment requests forwarded to the Owner shall be accompanied by a written recommendation for payment.

22. SUBSURFACE INVESTIGATION:

a. The following report is made available to the Contractor for his convenience.

Subsurface conditions presented, if any, are not intended as presentations or warrants of continuity of such conditions between soil borings or pits. It is expressly understood that the Contractor is solely responsible for interpretations or conclusions drawn therefrom. The Contractor may perform additional test borings and other exploratory operations at his expense, provided such operations are acceptable to the Engineer.

Report:

(Attached for information only)

23. DEPARTMENT OF THE ARMY PERMIT:

a. The Contractor is advised that work on this project is to be accomplished under a Department of the Army Permit and the Contractor is responsible for compliance with said permit and special requirements, if any, required by the Department of the Army or other agency having jurisdiction over the work.

b. A copy of the permit may be obtained from the Owner at the Office of the City Engineer.

SOIL & MATERIAL ENGINEERS INC. ENGINEERING-TESTING-INSPECTION
1937 Briarwood Ct., N.E., Atlanta, Georgia 30329, 404/325-1250

May 19, 1980

Robert and Company Associates
96 Poplar Street, N.W.
Atlanta, Georgia 30303

ATTENTION: Mr. John K. Shepard, P.E.

Subject: Report of Subsurface Investigation
Raw Water Intake Structure
Middle Oconee River
Athens, Georgia
S&ME Job No. AS-638

Gentlemen:

Soil and Material Engineers, Inc. is pleased to present this report covering the subsurface investigation made for the subject project. The work was done in general accordance with our proposal to you dated April 22, 1980. This report will present a summary section followed by a description of our investigation procedures, the data obtained, proposed construction and our evaluations and recommendations relative to the proposed construction.

SUMMARY

The following is a brief summary of our findings, conclusions and recommendations of this investigation. We refer you to remaining text sections for additional elaboration and details relative to the items presented.

1) Seven borings were made during this investigation, all of which were extended down to very hard soil or refusal materials at levels less than 15 feet (generally at elevations of 556 to 563). At three of these locations, the refusal materials were penetrated by coring; at two locations the refusal material was a thin lense of rock or boulder underlain by soft rock for several feet while at the third location, hard bedrock was found extending from below elevation 571.

2) Satisfactory foundation support on partially weathered rock or hard rock will be available at and below elevation 556 to 557.

3) Boulders and/or a hard rock lense will require penetration at most locations. Extensive hard rock excavation will be necessary within the southwest corner (near B-3).

4) Construction will require special procedures to maintain dry working conditions and stable excavation sides. Driving sheeting down to refusal materials is suggested.

INVESTIGATION PROCEDURES

Seven soil test borings were made during this investigation, at locations shown on the enclosed Site and Boring Location Plan. Six of the borings were made within the area of proposed construction of the intake structure; the seventh was made on the north bank of the Oconee River along the approximate alignment of a proposed new water line. Borings were located by our drilling manager by referencing from existing stakes and topo features. After completion of boring layout, five of the seven boring locations were surveyed to determine ground surface elevations.

All borings were advanced by extending a hollow stem auger down to refusal levels. At locations where coring was required, a wet rotary process was established and the boring was advanced using a core barrel and a diamond studded cutting bit. More detailed descriptions of boring, sampling and coring procedures can be found in the Appendix of this report. Soil Boring Records are enclosed in the Appendix, providing descriptions of the materials encountered, groundwater levels, etc. A cross-section extending through several borings is also presented.

SITE AND SUBSURFACE CONDITIONS

Site Conditions: The site is located on the southwest bank of the Middle Oconee River at the location where concrete piers of an old bridge structure still exist. Mitchell Bridge Road extends across the Middle Oconee River less than 75 feet to the south. The site is relatively flat at elevations generally of 573 to 575 with a drop off to the river channel of slightly less than 15 feet (to elevation 560). A bluff exists near the southwest corner of the building area with elevations rising to 580 and above.

The site is heavily overgrown with bushes and small trees. A recently cut sewer easement and associated dirt roadways cross through the site area.

Site Geology: The site is located in the Piedmont Geologic Province of Georgia. The geology of the Piedmont is characterized by metamorphosed sedimentary and igneous rocks with various types of localized intrusives. The structure is complex due to extensive faulting and minor faulting. Several ancient major faults affect the general geologic trends.

The site is covered by alluvial deposits emplaced by the Middle Oconee River. Underlying these alluvial sediments is an interlayered unit of biotite gneiss and feldspathic biotite gneiss. A large outcrop of similar rock extends beyond the north bank of the river and forms the river channel itself within most of the area.

Subsurface Conditions: Reference should be made to individual soil boring records for specific conditions found at each boring location. The descriptions which follow will generalize conditions, with specific references made as deemed advisable to highlight significant findings. The profile submitted in the Appendix should be reviewed along with these descriptions.

Alluvial soils, consisting of mixtures of sand, silt and clay, were penetrated at all locations. Generally the alluvium was of very low to low consistency with sands predominating. At all but one boring location, the driller noted very hard drilling at depths starting from about 11 to 14 feet, corresponding to about elevations 563 to 556. Refusal was encountered at or shortly below these depths at 5 of these 6 locations. At B-7, the hard material was augered for a lengthy time period and after penetrating 2 feet, easier drilling through partially weathered rock was noted until refusal was encountered at a depth of 30 feet. At B-2 and B-4, the refusal materials were cored; at both locations a hard rock lense or boulder was penetrated and was underlain by very soft rock.

Boring B-3 was made from a grade several feet above the remaining borings. It however encountered refusal at the shallowest depth, 11.3 feet, corresponding to elevation 570.3. Subsequently, the boring was offset several feet and B-3A drilled to confirm the refusal level and advance the hole deeper by coring. Boring B-3A refused at 9.0 feet and was cored till 19 feet. Hard interlayered biotite gneiss and feldspathic gneiss rock was encountered confirming a shelf of bedrock at this location rather than a rock lense or boulders as at other locations.

Groundwater was measured at all borings immediately after completion of drilling and 24 or more hours thereafter. Groundwater levels will of course vary considerably with fluctuations of the adjacent river. Stabilized readings indicated the expected trend of borings closest to the river having the lowest water table, with elevations of 564 to 565 at B-1 and B-5; with those furthest away, B-2 and B-3, having the highest, with elevations of about 570 or above.

PROPOSED CONSTRUCTION

A plan view of the proposed structure is shown on the enclosed Site and Boring Plan. The structure will have approximate plan dimensions

of 50 feet by 33 feet. Two wing walls will extend from the extremities of the structure, retaining earth from above the entrance pad down to the river. The structure will have lower floor elevations varying from 559 to 550. which corresponds to about 20 to 25 feet below existing grade within the area. Water mains will cross the Middle Oconee River at a location several feet above the proposed structure.

The recommendations presented below will be based on the data obtained from our borings and site inspection. Visual soil and rock descriptions along with standard penetration test and rock coring data are empirically correlated with similar conditions at other sites to develop appropriate design and construction recommendations.

EVALUATION AND RECOMMENDATIONS

Partially weathered rock and/or hard rock will be exposed at levels a few feet below proposed inside slab grades; ie. below elevations 557 generally and 548 within the pit area. Foundation support for the light structural loading is therefore no problem. Bearing pressures in excess of 10 ksf are available for design of foundations on partially weathered rock.

We understand that the weight of the structure, even under extreme conditions of buoyancy, will not require tie-down anchors. We would be happy to consult with you further if hold down support criteria are necessary.

For design of walls of the structure and wing walls, we recommend the following lateral pressures:

CONDITION	PRESSURE (pcf)
Above water table	60
Below water table	90 to 95

The above values are based on full hydrostatic conditions below the water table, sandy soil backfill and relatively rigid wall construction for which "at rest" pressure conditions are applicable.

Design should include the water table at levels corresponding to 100+ year flood levels.

Construction Problems: Excavation to slab and foundation levels will be made through very weak saturated sandy soils. If bracing is not used, excavations must be made on flat slopes and dewatering must be continuous. Since the construction will be at the bank of a river

which is known to exhibit very rapidly increasing water levels during storm events, special precautions and protection of the excavation and construction works are required. Driving sheeting along the river and possibly along the two building sides extending perpendicular to the river may be advisable to limit excavation and minimize water inflow. Corner and/or side to side braces to resist lateral soil and water pressures will be necessary. Since it will not be possible to drive sheeting several feet below inside excavation levels, special bottom braces and seals will be necessary. Pumping from wells or sumps inside the excavation will be required. We would be pleased to consult with you further concerning these items, if deemed appropriate.

As can be seen from a review of the borings and cross-section, some hard rock excavation, requiring blasting, will be necessary within the southwest area of structure (near B-3) and within the deeper pit area. Over most of the area, after penetrating the initial hard rock layer, softer rock is indicated. Removal of some of this softer rock by a large backhoe breaking away at it may be possible.

* * * * *

We have appreciated the opportunity of working with you on this project. If you have any questions or wish for us to further elaborate on any of the points made, please contact the writers.

Very truly yours,

SOIL AND MATERIAL ENGINEERS, INC.

Blanche M. Wallace
Staff Geologist

Stanley A. Schwartz, P. E.
Chief Engineer

BMW/SAS/jr
enclosures

KEY TO CLASSIFICATIONS

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	NO. OF BLOWS, N	RELATIVE DENSITY
SANDS	0 - 4	VERY LOOSE
	5 - 10	LOOSE
	11 - 20	FIRM
	21 - 30	VERY FIRM
	31 - 50	DENSE
	OVER 50	VERY DENSE
		CONSISTENCY
SILTS AND CLAYS	0 - 2	VERY SOFT
	3 - 4	SOFT
	5 - 8	FIRM
	9 - 15	STIFF
	16 - 30	VERY STIFF
	31 - 50	HARD
	OVER 50	VERY HARD

SOIL AND ROCK TEST BORING PROCEDURES

Borings were advanced by a rotary hollow-stem auger process. At the desired depth in all borings, the hole was cleaned out and the sampling tools inserted through the auger stems. Samples of the subsurface materials were obtained at 2.5 foot intervals in the initial 10 feet and at 5 foot intervals thereafter, using a split tube sampler. Split tube sampling operations were performed in accordance with ASTM Designation D-1586. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional foot with blows of a 140 pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the standard penetration resistance. When properly evaluated, it may be used as an index to the soil strength, density and ability to support foundations.

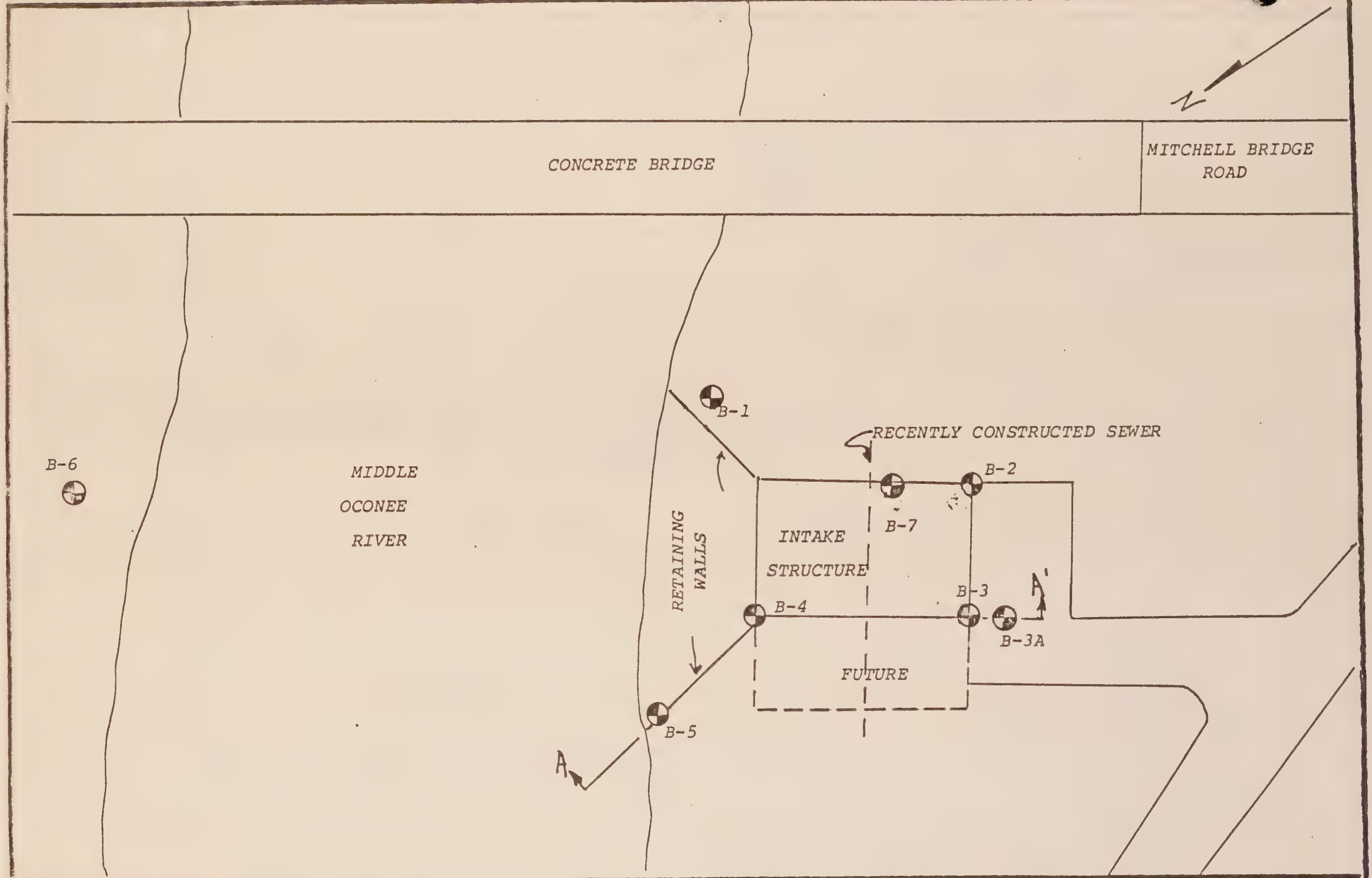
Representative portions of the split tube samples were examined by the writer for classification and stored in glass jars.

Refusal is defined as that level where further penetration of the auger is not possible without great difficulty. At this point, in selected borings, the drilling tools were removed and the refusal materials were cored using a diamond-studded bit fastened to the end of a hollow double-tube core barrel. This device is rotated at high speeds and is capable of cutting the hardest rock. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of the drill run, the inner core barrel is brought to the surface and the samples removed and placed in wooden boxes.

The samples were returned to our laboratory where the rock was identified and the recovery determined. The recovery is the ratio of the sample length obtained to the depth drilled expressed as a percent.

A record of the sampling operations and the descriptions of soils and rock encountered in each boring are shown on the following Soil Boring Record sheets.

APPENDIX


CONCRETE BRIDGE
MITCHELL BRIDGE ROAD
B-6
MIDDLE OCONEE RIVER
B-1
RECENTLY CONSTRUCTED SEWER
B-2
B-7
RETAINING WALLS
INTAKE STRUCTURE
B-4
B-3
A'
B-3A
FUTURE
B-5
A

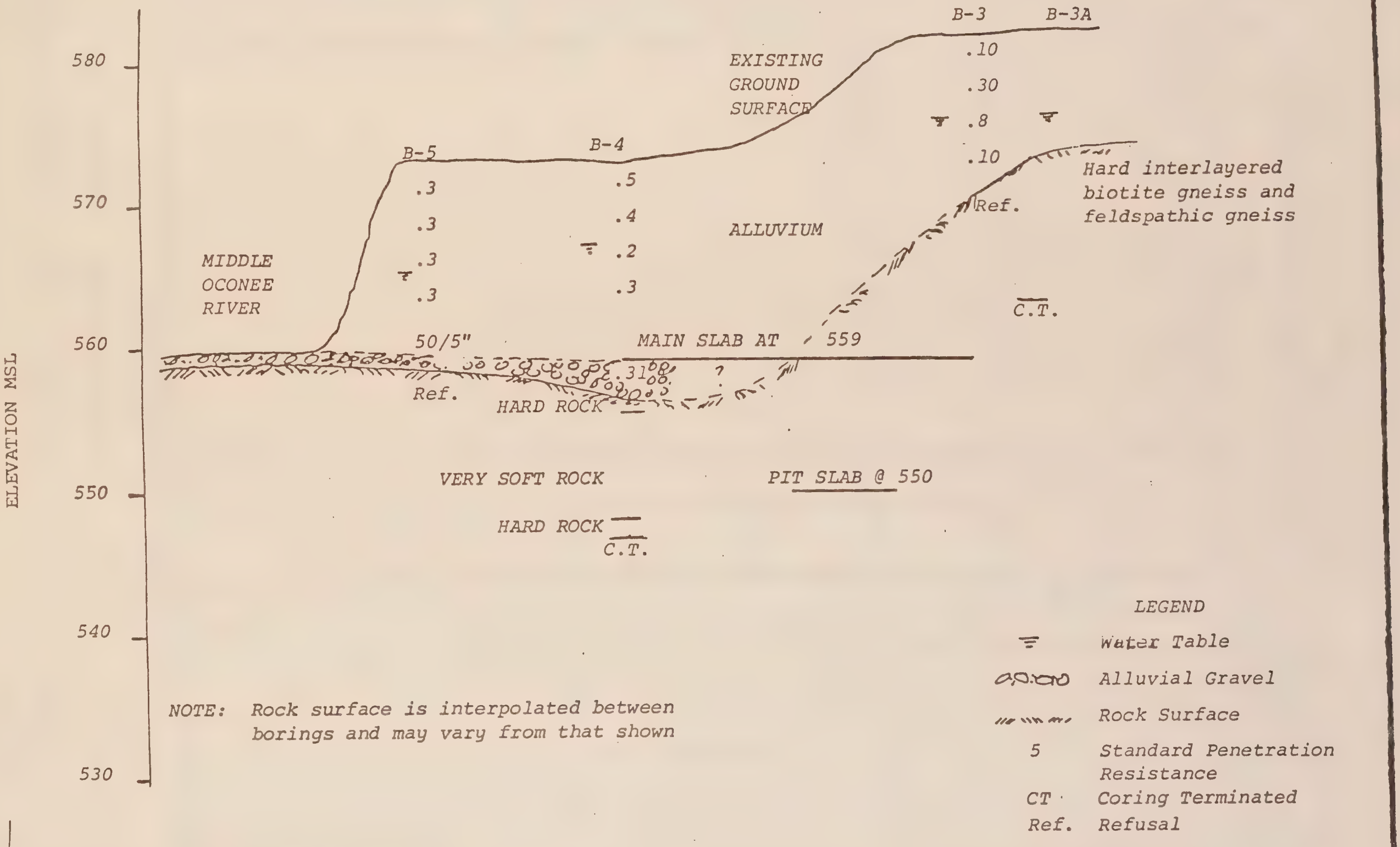
SCALE: 1" = 30'

SOIL & MATERIAL ENGINEERS INC.

Atlanta, Georgia

SITE AND BORING LOCATION PLAN
ATHENS INTAKE STRUCTURE
ATHENS, GEORGIA

S&ME JOB NO. AS-638


ELEVATION MSL
580
570
560
550
540
530
B-5
B-4
B-3
B-3A
EXISTING GROUND SURFACE
MIDDLE OCONEE RIVER
ALLUVIUM
.3
.3
.3
.3
50/5"
Ref.
.5
.4
.2
.3
.31
?
.10
.30
.8
.10
Ref.
C.T.
Hard interlayered biotite gneiss and feldspathic gneiss
MAIN SLAB AT 559
HARD ROCK
VERY SOFT ROCK
PIT SLAB @ 550
HARD ROCK
C.T.
LEGEND
Water Table
Alluvial Gravel
Rock Surface
5 Standard Penetration Resistance
CT Coring Terminated
Ref. Refusal

NOTE: Rock surface is interpolated between borings and may vary from that shown

SCALE: 1"=10'V
1"=20'H

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Atlanta, Georgia

CROSS-SECTION AA'
ATHENS RIVER INTAKE STRUCTURE

S&ME JOB NO. AS-638

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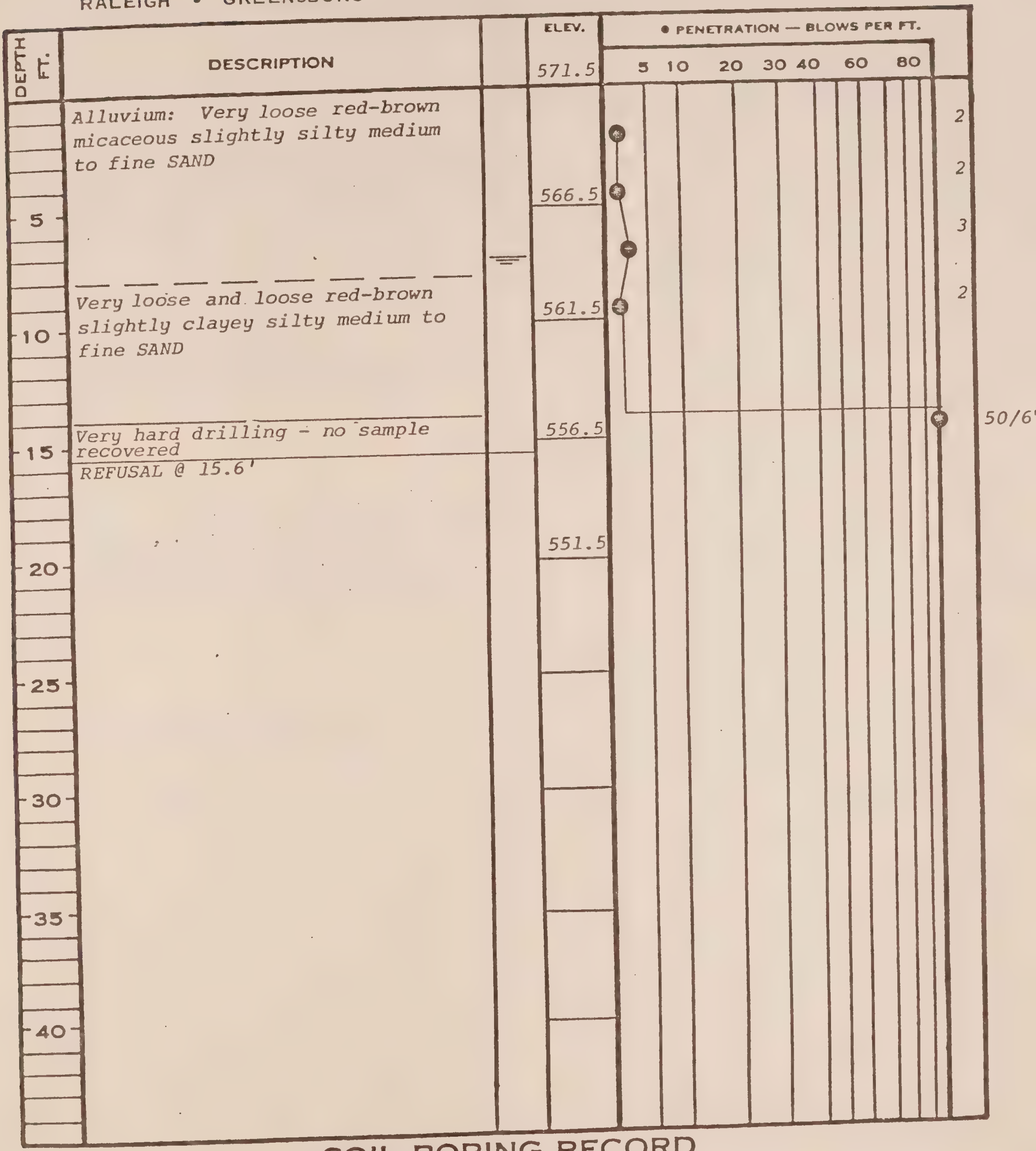

DEPTH FT.	DESCRIPTION	ELEV.	BLOWS PER FT.
0	*Alluvium: Very loose red-brown micaceous slightly silty medium to fine SAND*	571.5	2
			2
5		566.5	3
	Very loose and loose red-brown slightly clayey silty medium to fine SAND		2
10		561.5	
	Very hard drilling - no sample recovered		50/6"
15	*REFUSAL @ 15.6'*	556.5	
20		551.5	

SOIL BORING RECORD

◀ LOSS OF DRILLING WATER

WATER TABLE — 24 HR.

UNDISTURBED SAMPLE

WATER TABLE — 1 HR.

BORING NO. B-1

DATE DRILLED 4/28/80

JOB NO. AS-638

1 OF 1

BORING AND SAMPLING MEETS ASTM D-1586

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER

SOIL & MATERIAL ENGINEERS, INC.
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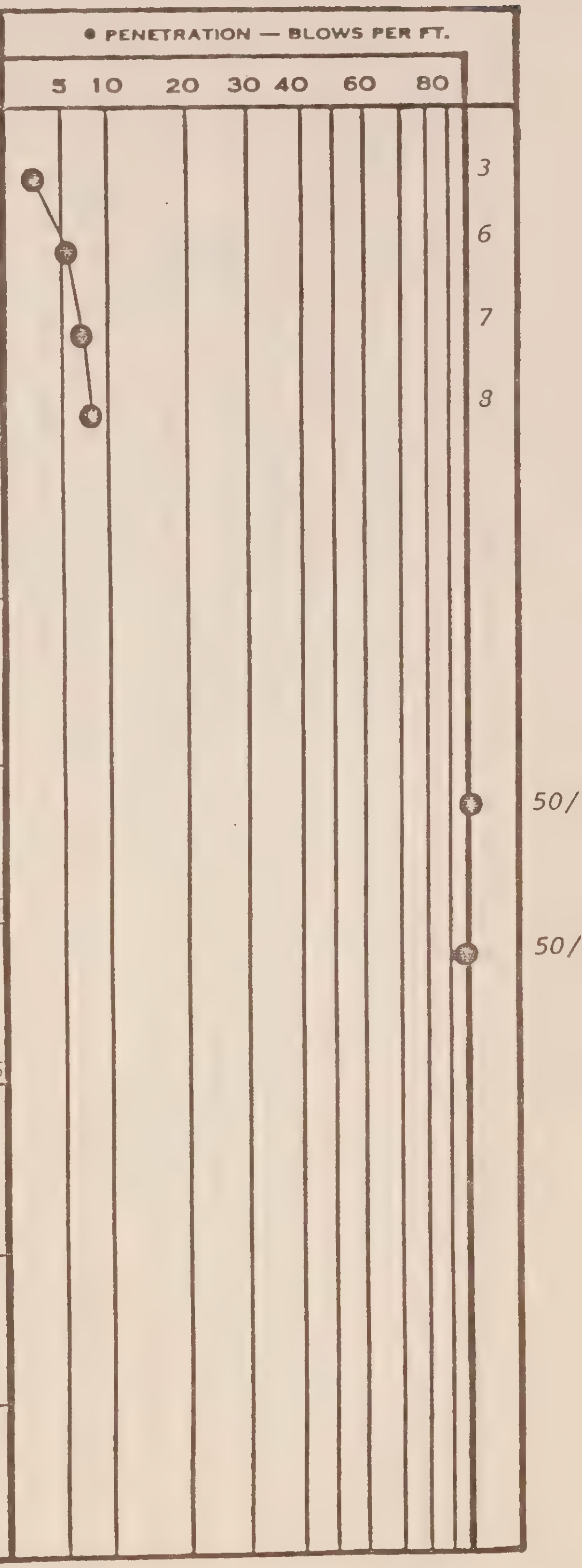
DEPTH FT.	DESCRIPTION		ELEV.
	Alluvium: Very loose red-brown slightly micaceous slightly clayey silty medium to fine SAND		574.5
5	Loose red-brown slightly micaceous slightly silty medium to fine SAND	═	569.5
10	Loose red-brown and tan mottled micaceous slightly clayey silty medium to fine SAND REFUSAL - CORING RECORDS BELOW *		564.5
15	Very soft rock - no recovery	10%	559.5
20	Moderately hard gray banded biotite gneiss with pegmatite zone	60%	554.5
25	Soft rock - no recovery	0%	549.5
30	CORING TERMINATED @ 26.7' *Hard gray biotite gneiss lense or boulder		544.5
35			
40			



SOIL BORING RECORD

◀ LOSS OF DRILLING WATER

═ WATER TABLE — 24 HR.

▭ UNDISTURBED SAMPLE

⊥ WATER TABLE — 1 HR.

BORING NO. B-2

DATE DRILLED 4/30/80

JOB NO. AS-638

BORING AND SAMPLING MEETS ASTM D-1586

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER

SOIL & MATERIAL ENGINEERS, INC.

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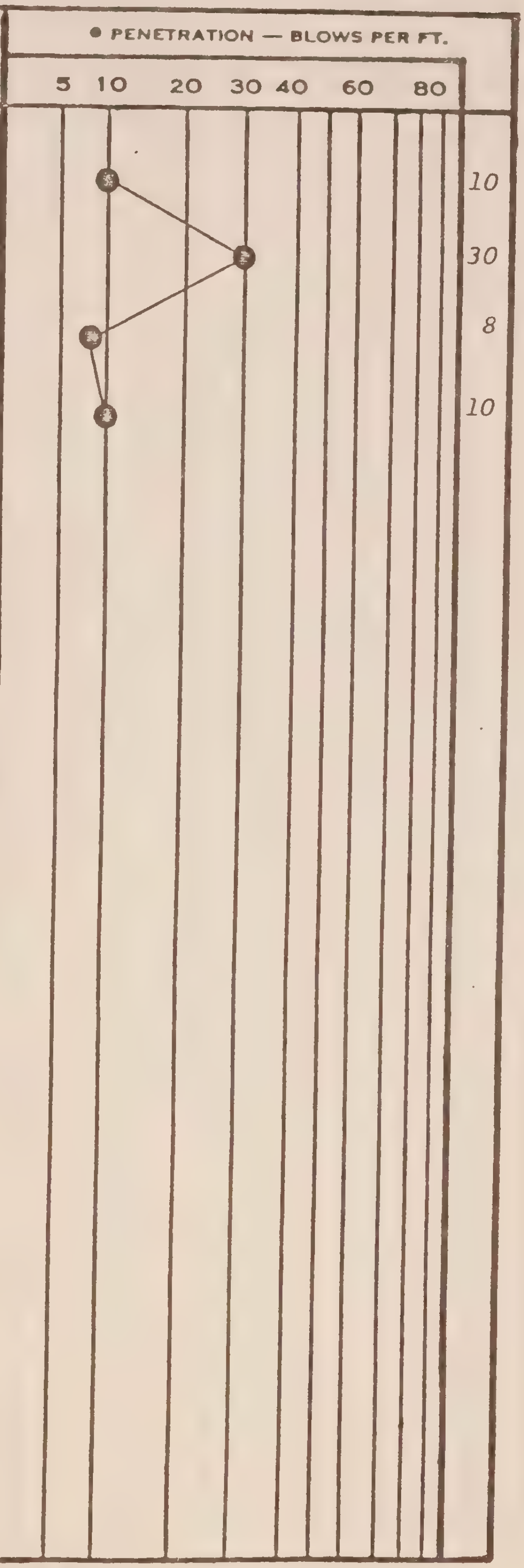
DEPTH FT.	DESCRIPTION		ELEV.
			581.5
	*Alluvium: Loose red-brown micaceous silty coarse to fine SAND***		
5	*Very stiff red-brown slightly micaceous clayey medium to fine****		576.5
	Loose red-brown slightly micaceous silty medium to fine SAND with minor fine gravel and trace of wood at 9.5 to 10.0'	≡	
10			571.5
	REFUSAL @ 11.3'		
	**Topsoil - 3"*		
15			566.5
	***with medium to fine gravel and partially weathered rock fragments*		
20	****sandy SILT with numerous partially weathered rock fragments*		
25			
30			
35			
40			



SOIL BORING RECORD

◀ LOSS OF DRILLING WATER

≡ WATER TABLE — 24 HR.

▭ UNDISTURBED SAMPLE

≡ WATER TABLE — 1 HR.

BORING NO. B-3

DATE DRILLED 4/28/80

JOB NO. AS-638

BORING AND SAMPLING MEETS ASTM D-1586

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER

SOIL & MATERIAL ENGINEERS, INC.

SPARTANBURG ● RALEIGH ● NORFOLK ● GREENSBORO ● ATLANTA

DEPTH FT.	DESCRIPTION		ELEV. 582.0	● PENETRATION — BLOWS PER FT. 5 10 20 30 40 60 80
	Auger Boring - See B-3 for description			
5			577.0	
		*		
	REFUSAL - Coring Record Below			
10	Hard interlayered biotite gneiss and feldspathic gneiss	73%	572.0	
15			567.0	
20	CORING TERMINATED @ 19.0'		562.0	
25	*Taken shortly after heavy rainfall - may be run off into hole			
30				
35				
40				

SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER
FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I. D. SAMPLER 1 FT.

WATER TABLE — 24 HR.
WATER TABLE — 1 HR.

BORING NO. B-3A
DATE DRILLED 5/14/80
JOB NO AS-638

SOIL & MATERIAL ENGINEERS, INC.

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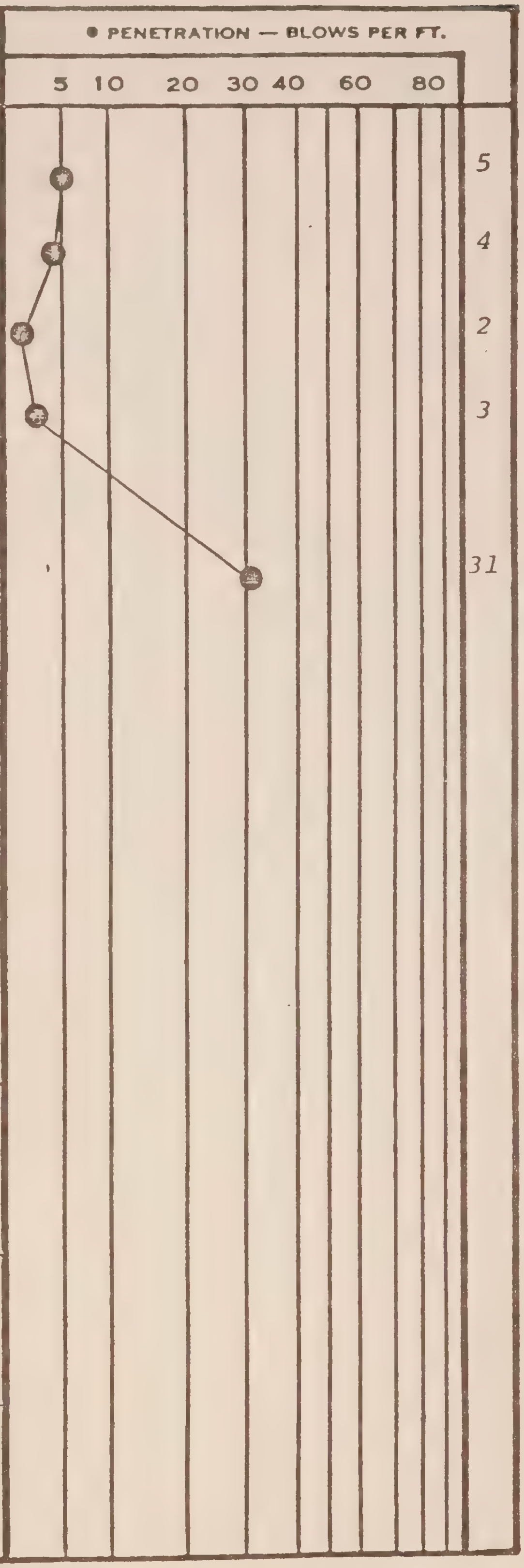
DEPTH FT.	DESCRIPTION		ELEV.
			572.5
	Alluvium: Loose and very loose red-brown micaceous silty medium to fine SAND		
5	*Very loose red-brown micaceous slightly clayey silty medium to fine SAND*	≡	567.5
10			562.5
15	*Dense gray micaceous coarse to fine SAND with coarse to fine** ****		557.5
	Very soft rock - no recovery	*10%*	
20			552.5
		47%	
25	*Hard gray banded biotite gneiss*		547.5
	CORING TERMINATED @ 26.3' **gravel and rock fragments* ***Hard gray banded biotite gneiss lense or boulder*		
30			542.5
35			
40			



SOIL BORING RECORD

◀ LOSS OF DRILLING WATER

═ WATER TABLE — 24 HR.

▭ UNDISTURBED SAMPLE

⌐┘ WATER TABLE — 1 HR.

BORING NO. B-4

DATE DRILLED 4/29/80

JOB NO. AS-638

BORING AND SAMPLING MEETS ASTM D-1586

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER

SOIL & MATERIAL ENGINEERS, INC.

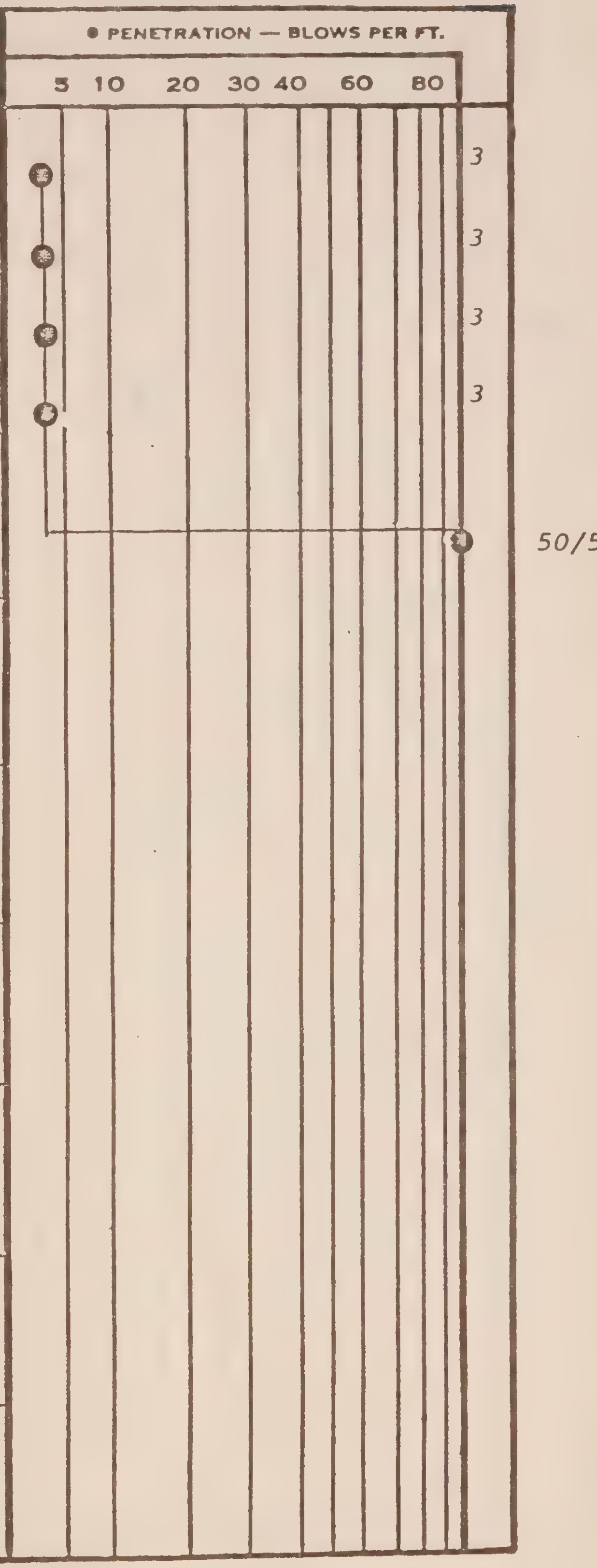
ATLANTA • ALBANY

RALEIGH • GREENSBORO • WILMINGTON • TRI-CITIES • SPARTANBURG

DEPTH FT.	DESCRIPTION	ELEV. 573.0
	Alluvium: Very loose red-brown micaceous silty medium to fine SAND	
5	Soft red-brown micaceous slightly clayey fine sandy SILT	568.0
10	Very loose brown micaceous slightly silty medium to fine SAND	563.0
	Very dense gray micaceous silty medium to fine SAND with zones**	558.0
15	REFUSAL @ 14.5'	

*Alluvium: Very loose tan silty fine SAND

**of coarse to fine SAND and coarse to fine rounded gravel



SOIL BORING RECORD

LOSS OF DRILLING WATER

WATER TABLE — 24 HR.

UNDISTURBED SAMPLE

WATER TABLE — 1 HR.

BORING NO. B-5

DATE DRILLED 4/28/80

JOB NO. AS-638

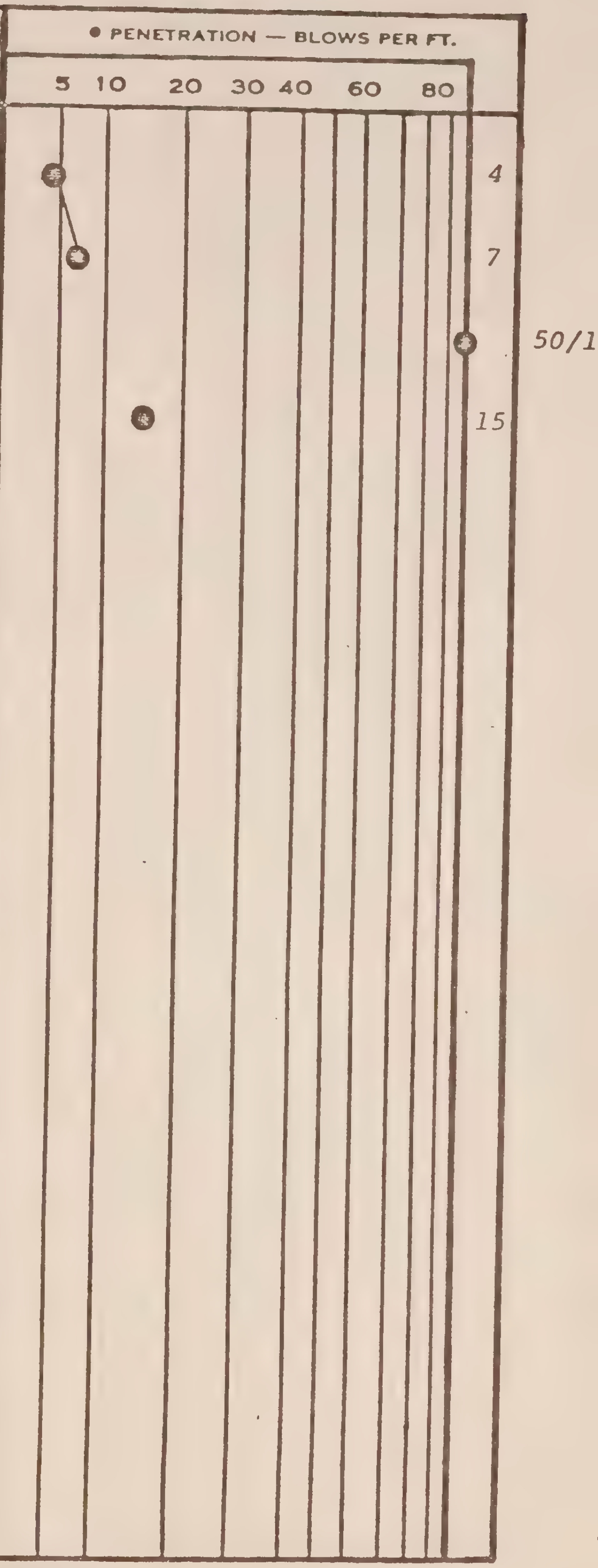
BORING AND SAMPLING MEETS ASTM D-1586

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER

SOIL & MATERIAL ENGINEERS, INC.

SPARTANBURG • RALEIGH • NORFOLK • GREENSBORO • ATLANTA

DEPTH FT.	DESCRIPTION		ELEV.
			569.0
	*Alluvium: Very loose red-brown slightly micaceous coarse to fine SAND		
5	Loose red-brown micaceous slightly silty medium to fine SAND		564.0
	Boulder		
10	Firm gray brown slightly micaceous silty coarse to fine SAND with much coarse to fine rounded gravel	═	559.0
	REFUSAL @ 12.7'		
15	*Alluvium: Tan silty fine SAND		554.0
20			
25			
30			
35			
40			



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I. D. SAMPLER 1 FT.

═ WATER TABLE — 24 HR.
▭ UNDISTURBED SAMPLE
═ WATER TABLE — 1 HR.
(50) % ROCK CORE RECOVERY
◁ LOSS OF DRILLING WATER

BORING NO. B-6
DATE DRILLED 4/30/80
JOB NO. AS-638
PAGE 1 OF 1

SOIL & MATERIAL ENGINEERS, INC.

SPARTANBURG ● RALEIGH ● NORFOLK ● GREENSBORO ● ATLANTA

DEPTH FT.	DESCRIPTION		ELEV.	● PENETRATION — BLOWS PER FT. 5 10 20 30 40 60 80
	Alluvium		573.5	
5			568.5	
		≡		
10			563.5	
	Very hard drilling through boulder or rock lense			
	Partially weathered rock			
15			558.5	
20			553.5	
25			548.5	● 50/2"
30			543.5	
	REFUSAL @ 30.0'			
35			538.5	
40				

SOIL BORING RECORD

*Made as auger boring to 25 foot sample

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I. D. SAMPLER 1 FT.

≡ WATER TABLE — 24 HR.

▭ UNDISTURBED SAMPLE   WATER TABLE — 1 HR.

BORING NO. B-7*

DATE DRILLED 5/14/80

JOB NO. AS-638

PAGE 1 OF 1

SECTION 2A1

SITE CLEARING:

PART 1 - GENERAL:

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF THE WORK:

This section applies to clearing, grubbing, and other related work in conjunction with sitework. Work includes the following:

Clearing and Grubbing
Protecting Existing Improvements
Repairing Damaged Improvements
Stripping and Stockpiling of Topsoil

Related Work Specified Elsewhere:

Earthwork, Section 2B1
Grassing, Section 2C

PART 2 - PROCEDURE:

Clearing and Grubbing:

Unless otherwise noted or required, remove all timber, shrubs, vegetation, stumps, roots, boulders, debris, and other objectionable material from the site, within the limits indicated on the Drawings, or, if not indicated, within the construction right-of-way, providing adequate space for work and access.

Cut trees over 4-inches in diameter into logs approximately 24-inches long and stack neatly within the right-of-way at the clearing limits, until such time as they are removed from the site.

Where existing ground is to be filled, remove all stumps, roots, and other debris to a depth of one foot below ground. Plow the surface to a depth of six-inches and remove all debris exposed to a depth of at least one-foot. Proof-roll where indicated on the Drawings or required by the Engineer.

Combustible material may be burned prior to removal where permitted by local authorities.

Strip topsoil within the clearing limits and stockpile separately for spreading at a later date. Protect stored topsoil to prevent erosion.

Protection of Existing Features:

Protect trees, shrubs, and improvements within the clearing limits where indicated on the Drawings or required by the Engineer. Preserve all trees outside the clearing limits. Take special precautions to protect any ornamental trees, shrubs, or vegetation, fences, walks, utilities, structures, paving, or other property. Repair or replace any property damaged.

Where clearing requires breaching fences, provide pasture type fence gates as indicated on the Drawings or, if not indicated, of a size suitable for access.

Maintain existing drainage to protect new and existing construction, unless noted otherwise. Maintain culverts and ditches. Install temporary culverts where required. Provide straw bales,impoundments, or other means necessary to prevent erosion and for siltation due to construction. Comply with applicable laws and/or regulations.

SECTION 2B1

EARTHWORK:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This section applies to all earthwork required, including excavation, filling, grading, and other work as follows:

Trenching and Backfilling
Protecting Existing Improvements
Repairing Damaged Improvements
Restoring Surfaces

Related Work Specified Elsewhere:

Site Clearing, Section 2A1
Process Piping, Section 13W1
Grassing, Section 2C

SUBMITTALS:

Where required elsewhere in the Contract Documents or by the Engineer, submit certified laboratory tests on the following:

Structural Fill Materials:

Submit samples of each type of material proposed for use as fill to the Laboratory for analysis of Structural and Compaction Properties, and suitability for use as Structural Fill.

Approval of fill material by the Engineer will be based on the Laboratory reports and recommendations.

The Laboratory reports shall include:

1. Indication of source of material.
2. Soil classification.
3. Grain size distribution.
4. Liquid Limit.
5. Plastic limit.

6. Plasticity index.
7. Moisture-Density curve.
8. Other pertinent data, and a statement of compliance with Structural requirements.

Sand and Gravel:

Submit laboratory test results or manufacturers certification, evidencing compliance with the specifications.

REFERENCE SPECIFICATIONS:

ASTM D698-70, Method of Test for Moisture-Density Relations of Soils using 5.5 pound Rammer and 12 inch Drop, Method B or D.

ASTM D1556-64, Standard Method of Test for Density of Soil in Place by the Sand Cone Method.

ASTM D1194-72, Standard Method of Test for Bearing Capacity of Soil for Static Load on Spread Footings.

ASTM D422-63, Standard Method for Particle-Size Analysis of Soils.

ASTM D423-66, Standard Method of Test for Liquid Limit of Soils.

ASTM D424-59, Standard Method of test for Plastic Limit and Plasticity Index of Soils.

PART 2 - MATERIALS

FILL AND BACKFILL:

Select durable inorganic earth materials approved by the Engineer. Use material free of roots, trash, debris, rocks over 6 inches, and topsoil, with moisture content within the range required for proper consolidation.

Satisfactory Material:

Use selected durable inorganic earth material approved by the Engineer and conforming to AASHTO M145, soil classification groups A-1, A-2-4, A-2-5, and A-3.

Use material free of roots, trash, debris, rocks over 2 inches, and topsoil, with moisture content within the range required for proper consolidation.

Unsatisfactory Material:

Unsatisfactory soil material consists of materials defined by AASHTO soil classification groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7, and other material with high organic content or other detrimental characteristics as determined by the Engineer as unacceptable for fill and/or backfill.

Sand:

Clean hard, durable sand, free of organic materials and conforming to ASTM C144.

Gravel:

Hard, durable clean gravel, uniformly graded from fine to coarse, free from debris, organic, or other objectionable material. Use gravel with a maximum aggregate size of 3/4 inches, with not more than 10 percent passing a No. 4 sieve. Use sound material, not subject to decomposition in contact with water.

FILTER FABRIC:

Use spunbonded polypropylene sheet structure composed of preferentially oriented isotactic polypropylene continuous filaments thermally bonded. Use minimum 15 mil thickness with weight approximately 4 oz. per square yard and permeability not less than 2×10^{-2} cm/sec with an opening size from 70 to 100 - U. S. std. sieve size. Use filter fabric recommended by manufacturers for application in drainage systems, and structurally stable in buried application.

PART 3 - EXECUTION

GENERAL:

Strip topsoil suitable for support of plant life from all areas within working limits. Stockpile and protect topsoil until distribution for finish grading.

Keep excavations free of water either from surface sources or from underground sources or from both. Be responsible for all damage incurred in handling water conditions.

Excavate footings to firm undisturbed soil.

Excavate to neat size of concrete bottom surfaces and where soil conditions permit, for sides of footings. Otherwise, excavate with sufficient clearance to permit forming, inspection and completion of work.

Discard any portions of excavated material which are unsuitable or not approved for use as structural fills or backfills.

Dispose of unsuitable material in spoil areas designated in the Drawings or selected by the Engineer.

Generally, construct fills from approved excavated material found on site. Provide approved borrow material when on-site material is not available.

Existing Improvements:

Locate all below ground utilities or other improvements prior to beginning excavation. Notify the Engineer of any potential conflicts with the work. Except for improvements requiring demolition, abandonment, removal, or replacement, make every effort to protect existing improvements. Coordinate construction with utility or other improvement owners, obtaining any special permits or bonds required.

Pavement Removal:

When excavation requires the removal of paving, curb and gutter, or related improvements, neatly saw cut at limits of material to be removed. Remove required paving while protecting remaining surfaces.

Overexcavation:

Where the excavation is extended below the required elevation, fill to required elevation by compacting gravel in six inch lifts to a minimum of one hundred percent of maximum dry density in accordance with ASTM D698.

Overexcavation may be required by the Engineer when soil conditions in the bottom of the excavation are not sufficiently stable for proper installation of improvements.

Shoring and Bracing:

Construct shoring, bracing, sheeting, or other means necessary to stabilize the sides of the excavation to protect new or existing improvements from damage or distress due to excavation operations, and for the safety of persons in or around the excavation. Maintain shoring and bracing until work has progressed to the point where it can be safely removed. Remove all shoring and bracing unless otherwise noted or required by the Engineer.

Comply with all applicable safety regulations.

FILL:

General:

Place fill material in lifts not greater than six inches thick. Compact fill using appropriate hand or mechanical compaction devices. Unless otherwise noted on the Drawings, obtain minimum compaction based on ASTM D698 - Method C as follows:

Within 10 feet of structures - 100%
Under footings - 100%
Parking lots and roadbeds - 95%
Sidewalks - 90%
Grassed Areas - 85%
Spoil Areas - 85%

Pipe Bedding:

Hand excavate final six inches of trench depth. Grade trench bottom uniformly to match pipe grade. Shape bottom of trench by hand to match pipe diameter so that full support is provided for the bottom 1/8 diameter of the pipe. Hand excavate under bells so pipe load is uniformly supported on pipe barrel. Remove all base material and bed pipe in firm unidsturbed earth, or where over excavation is necessary, on firm stable material compacted t9 100% of ASTM D698.

Limit trench width within 12 inches of top of pipe, to eighteen inches larger than outside diameter of pipe, unless otherwise approved by the Engineer.

Comply with more stringent bedding requirements of the pipe manufacturer as appropriate for the actual installation, including extending bedding to spring line of pipe, providing concrete bedding, or other methods required.

Carefully hand place select backfill and mechanically compact to 100% of ASTM D698. Extend hand placed backfill to 12 inches above top of pipe, then continue backfill achieving results as specified for area.

Structural Fill:

Structural fill and backfill are required under all concrete slabs on grade where indicated on the plans, Roadways and Parking Lots.

Start all structural fills from bare sub-soil from which topsoil, roots, and surface debris has been removed.

Place all structural fill and backfill in layers not exceeding 6 inches in depth, loose measurement, and compact each layer to 100 percent of maximum density determined by ASTM D698.

Spread four inches of porous fill below floor slabs on grade. Compact to 100% density as specified above.

Structural fills and backfills may be constructed only from approved select materials.

Blasting:

When acceptable to the Engineer, blasting methods may be used at the Contractor's own risk. Obtain any permits necessary from authorities prior to commencing. The handling, storage and use of all blasting supplies shall be in accord with Federal, State and Local regulations and shall be done subject to the approval of the Engineers.

All blasting shall be performed under the supervision of a licensed blaster having qualifications and experience acceptable to the Engineer.

Exposed structures shall be protected from the effects of blasts and blasts shall be covered with suitable mats. Blasts shall be restricted to the extent that no appreciable shock will be tranmitted to existing structures, pipe lines, sewers, cables or other public or private facilities.

The Contractor shall be wholly responsible for any and all personal injury or property damage resulting from blasting.

Grading:

Grade areas outside structural fills to the finish elevations indicated on the Drawings, or, if not indicated, to approximate original ground.

Where grades are not given, produce uniform slopes between indicated elevations or between indicated elevations and existing grades. Do not produce grades steeper than 1 vertical to 3 horizontal, unless steeper grades are specifically indicated.

Remove all rocks, roots, and debris from fill or topsoil, or both, for a depth of one foot from finished surface in all graded areas outside the limits of buildings or paving.

Redistribute previously stockpiled topsoil over all graded areas not covered by buildings or structures, to a uniform depth of four inches or greater, if required to produce specified ground cover, to bring earthwork from offsite if sufficient on-site quantities are not available.

Surface Restoration:

When finished ground surface is not indicated on Drawings, restore ground surface to match surrounding area. Leave surface in no less desirable condition than before beginning construction. Where work is done on private property, accomplish restoration to the satisfaction of the property owner and the Engineer. Refer to the related specifications where applicable.

Remove all construction material and debris, including trash, broken pipe, chemical containers, brick, and other items.

Rock Excavation:

Rock is defined as hard solid, natural material having a hardness of three (3) or greater on the Mohs scale of mineral hardness, giving a "ringing" solid sound when struck by a hammer and which requires, in the opinion of the Engineer, rippers, rock plows, jackhammers, or blasting for removal. Solid, fractured, weathered, or partially weathered material which can be loosened with a pick, or boulders smaller than one cubic yard will not be considered as rock regardless of hardness or method of excavation required.

No additional payment will be made for rock excavation unless listed on the Proposal Form.

Compaction Tests:

Provide compaction tests for fill control pruposes, performed by an independent testing laboratory. The extent of compaction tests will be as directed by the Engineer. Moisture-density curves will be required for the different fill materials used.

All costs of compaction testing will be paid by the Contractor. The cost of in-place density tests indicating compliance with the Specifications will be reimbursed to the Contractor by the Owner in accordance with the Testing Laboratory Services provisions of the General Requirements, Section 1G.

SECTION 2C

GRASSING:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This section applies to grassing required for surface restoration, ground cover for areas disturbed by the Work for which no other surface restoration is indicated, and areas specifically designated for grassing.

Related Work Specified Elsewhere:

Site Clearing,	Section 2A1
Earthwork,	Section 2B1

Reference Specifications:

Georgia Department of Transportation
"Standard Specification - Construction of
Roads and Bridges, April 1972" referred to
as DOT

PART 2 - MATERIALS:

Seed: Fescue Kentucky 31 or Hulled Bermuda per DOT Article 890.01. Fescue mixture may be used when acceptable to the Engineer. For lawn areas, match existing grass where required by the Resident Inspector.

Mulch: Conform to DOT Article 893.02 for mulching.

Lime: Conform to DOT Article 882.02.

Fertilizer: Conform to DOT Article 891.01. Use either 6-12-12 4-12-12, or 5-10-15 as required by soil conditions.

Water: Conform to DOT Article 700.02.

PART 3 - EXECUTION:

Seeding:

Comply with the following:

Time of Year	Seed Permitted	Application Rate
February 15 to April 15	Fescue Kentucky 31	10 pounds per 1000 square feet
April 15 to August 15	Hulled Bermuda	3 pounds per 1000 square feet
August 15 to	As approved by the Engineer	
November 15 to February 15	None	

Soil Preparation and Planting:

Remove any stones over 1" in size, sticks, roots, or deleterious materials from the site.

Plow, disc, harrow and till to a depth of 4" to 6".

Test soil to determine what pH adjustments shall be made. If pH of soil is below 6.0, add agricultural limestone at a rate of 50 pounds per 1000 sq. ft., spread uniformly over the entire area.

Fertilize with either 6-12-12, 4-12-12, 5-10-15, or other suitable type as required by soil conditions, at a rate of 30 pounds per 1000 sq. ft., spread uniformly over the entire area.

Mix lime and fertilizer into the top 4" of soil using suitable harrows or rotary tillers.

Hand rake, level, and smooth all lawn areas.

All soft spots and uneven grades shall be corrected. Weather permitting, sow seed within 24 hours after liming and fertilization using mechanical drills, rotary hand seeders or other approved methods.

Cover seed and fertilizer by lightly raking with mechanical tools. Mulch with straw at rate of 2 tons per acre

Maintenance:

Begin maintenance immediately after each portion of lawn is planted and continue for at least six (6) weeks. Maintenance includes watering, erosion repair, weeding, mowing, etc.

Prevent the lawn from drying out and "crusting over" after the seed start to germinate.

Acceptance:

At the end of the maintenance period, the Engineers shall inspect the lawn and if at that time a sufficient coverage of grass is apparent, the Contractor will be relieved of his responsibility for the lawn. Otherwise he will be required to replant unacceptable areas.

The Contractor shall guarantee viability and thrifty grown for a period of one year following acceptance of initial germination. 90% coverage is acceptable if void areas are generally boadcast and do not exceed one square yard in area.

Remote Areas:

Other ground cover may be used in lieu of grassing in remote, unpopulated areas such as woods, marshes, along waterways, and other similar locations where acceptable to the Resident Inspector.

In such locations, the Contractor shall achieve adequate ground cover by maintaining the areas until acceptable natural vegetation is reestablished, or until alternative ground covers are established.

The acceptance of alternate ground cover in no way relieves the Contractor from the requirements for preventing siltation and erosion, or from maintaining the area through the maintenance period. Ground cover, either grassing or other, must be established before project completion.

SECTION 2D

PAVING:

PART 1 - GENERAL:

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Supplementary Conditions and General Requirements, if any, apply to the Work specified in this section.

DESCRIPTION OF WORK:

The extent of paving work is indicated on the Drawings. Work includes the following:

Constructing bituminous paved surfaces.

Constructing concrete walks.

REFERENCE SPECIFICATIONS;

State Highway Department of Georgia Standard Specifications for Construction of Highways and Bridges, dated September 15, 1977, hereinafter referred to as DOT.

SUBMITTALS:

Submit manufacturer's data evidencing compliance with the specifications. Include submittals on the following:

Asphalt materials
Mix design and gradation

PART 2 - MATERIALS:

Soil Aggregate for Base Courses: DOT Article 815.01.

Cutback Asphalt: DOT Article 821 (Mc30).

Aggregate for Asphaltic Concrete: DOT Article 802.

Asphalt Cement: DOT Article 820.04, penetration grade 85-100.

Asphaltic Concrete: DOT Section 400.

Concrete: As specified in Section 3A0, Concrete Work .

PART 3 - INSTALLATION:

BITUMINOUS PAVING:

Prepare subgrade in accordance with Section 2B1, Earthwork.

Prepare base course with MC30 at the rate of 0.30 gallons per square yard, DOT Section 412.

Construct Binder Courses of Asphaltic Concrete containing course and fine aggregates blended to produce total gradation as follows:

Size of Sieve	Percent Passing
1"	100
3/4"	95 - 100
3/8"	40 - 75
No. 8	20 - 40
No. 50	5 - 20
No. 100	0 - 10
No. 200	0 - 5

Combine with 4.5 to 7 percent by weight of Asphalt Cement AC8.

Construct finish courses of asphaltic concrete containing course and fine aggregates blended to produce total gradation as follows:

Size of Sieve	Percent Passing
1/2"	100
3/8"	95 - 100
No. 8	50 - 80
No. 16	35 - 50
No. 50	15 - 35
No. 100	10 - 15
No. 200	5 - 10

Combine with 6 to 10 percent by weight of Asphalt Cement AC 8

Construct base course to compacted thickness of 6 inches, prime, apply binder course to compacted thickness of 2-1/2 inches, apply finish course to compacted thickness of 1-1/2 inches.

Stripe pavement in accordance with DOT Section 652 in locations indicated on Drawings. All lines solid traffic stripes. Omit all reference to measurement and payment.

Concrete Walk:

Construct 4 inch minimum thickness of concrete in widths as indicated on the drawings. Install control joints at 10 feet maximum on center and isolation joints at 30 feet maximum on center. Slope surfaces to drain and provide broom finish (non-slip).

SECTION 2F

METAL FENCING:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this section.

DESCRIPTION OF WORK:

The extent of metal fencing work is shown on the Drawings.

REFERENCE SPECIFICATIONS:

Chain Link Fence Manufacturers Institute (CFMI)

SUBMITTALS:

Manufacturer's Data:

For information only, submit manufacturer's data, specifications, and installation instructions for metal fencing and gates. Indicate by transmittal that a copy of each instruction has been forwarded to the installer.

JOB CONDITIONS:

Installer must examine the conditions under which the fence and gates are to be installed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

Provide metal fences and gates as complete unit produced by a single manufacturer including necessary erection accessories, fittings and fastenings.

Comply with the standards of the CFMI.

PART 2 - PRODUCTS:

STEEL FENCING:

Fabric: Use 2 inch mesh, 9 gage minimum wire fabric in height as indicated on the Drawings. Use one piece fabric widths galvanized per ASTM A 392, Class I with not less than 1.2 ounce zinc per square foot. Provide colored when indicated.

Wire: Manufacturer's standard heavily galvanized steel.

Barbed Wire: Manufacturer's standard heavily galvanized steel.

Framework: Galvanized steel, ASTM A 120, with not less than 1.8 ounce zinc per square foot.

Hardware and Accessories: Galvanized, ASTM A 152, with zinc weights per Table I.

FRAMING AND ACCESSORIES:

End, Corner and Pull Posts: Use 3 inch O.D. galvanized steel tubing with minimum weight of 5.79 pounds per foot.

Line Posts: Use 2-1/2 inch O. D. galvanized steel tubing with minimum weight of 5.79 pounds per foot.

Top Rail: Use 1-5/8 inch O.D. galvanized steel tubing furnished in manufacturer's longest lengths, with expansion type couplings, approximately 7 inches long, for each joint. Provide means for attaching top rail securely to each gate, corner, pull, and end post.

Tension Wire: Manufacturer's standard tension wire system.

Provide at bottom of fabric only.

Post Brace Assembly: Provide brace at both sides of corner and pull posts matching existing.

Post Tops: Weathertight closure cap (for tubular posts), one cap for each post.

Furnish caps with openings to permit passage of top rail.

Stretcher Bars: Full fabric height, one piece length, not less than 3/16 inch x 3/4 inch section.

Stretcher Bar Bands: Space not over 15 inch o.c. to secure stretcher bars to end, corner, pull, and gate posts.

Wire Ties: For tying fabric to line posts, use wire ties spaced 12 inches o.c. For tying fabric to rails and braces, use wire ties spaced 24 inches o.c. For tying fabric to tension wire, use hog rings spaced 24 inches o.c.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

Concrete: Provide concrete consisting of Portland cement, ASTM C 150, aggregates, ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi.

Gates: Use 2 inch O. D. galvanized steel frame with internal bracing, and top and bottom rails, of welded construction with filler fabric same as specified for fence. Provide keepers, hasps, cane bolts, and other accessories necessary for locking in closed position, and holding in open position.

Galvanizing: Hot dip galvanize all ferrous material to produce a zinc coating weighing not less than 1.4 ounces per square foot of metal surface area.

ALTERNATE STEEL FENCING:

Alternate steel fencing using alternate post sections equal in strength and quality to those specified may be used subject to Engineers approval when requested by the Contractor or required to match existing fencing.

PART 3 - EXECUTION

INSTALLATION:

Do not begin installation and erection before final grading is completed, unless otherwise permitted.

Excavation: Excavate holes to the diameters as recommended by the CFMI.

Excavate hole depths approximately 3 inches lower than the post bottom, with bottom of posts set not less than 36 inches below the surface. Excavate deeper as required for firm support in soft and loose soils, and for posts with heavy lateral loads.

Setting Posts: Center, align and set posts in holes with post 3 inches above bottom of excavation.

Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

Tension Wire: Install tension wires by weaving through the fabric and tying to each post with not less than 6 ga. galvanized wire, or by securing the wire to the fabric.

Fabric: Leave approximately 2 inches between finish grade and bottom selvage, unless otherwise shown. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

Stretcher Bars: Thread through or clamp to fabric 4 inches o.c., and secure to posts with metal bands spaced 15 inches o.c.

Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.

Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposute fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

Barbed Wire: Install barbed wire on extension arms as indicated on Drawings.

EXISTING FENCING:

Remove and relocate existing fencing where indicated on the Drawings. Repair or replace existing fencing to be relocated so finished installation is like new.

SECTION 2T1

DRAINAGE STRUCTURES AND ACCESSORIES:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This section applies to the construction of drainage structures and accessories. Work consists of the following:

Furnishing and installing drainage structures and accessories.

The extent of drainage structure work is indicated on the Drawings.

Related Work specified elsewhere:

Earthwork, Section 2B1
Process Piping, Section 13 W1

Submittals:

Submit manufacturer's data evidencing compliance with the specifications. Submit manufacturer's recommendations for installation where applicable or where requested by the Engineer. Include submittals on the following:

Manhole Steps

PART 2 - MATERIALS AND PRODUCTS:

Where more than one material or product is included for a specific item, any of the materials or products listed may be used at Contractor option unless otherwise indicated on the Drawings.

Masonry Materials:

Brick: Use dense common brick conforming to ASTM C62, Grade SW.

Portland Cement: Use Portland Cement complying with ASTM C-150, Type 1.

Sand: Use clean, hard, durable sand, free of organic materials and conforming to ASTM C144.

Hydrated Lime: Use C207, Type S.

Water: Use clean water without excess acids, alkalies, or organics.

Mortar Mix Proportions: Combine one part Portland Cement to three parts sand with hydrated lime equal to 5 to 10 percent of the volume of the cement.

Standard Manhole Frames and Covers:

Use heavy duty gray cast iron manhole frames and covers complying with ASTM A30 properties. Provide castings of uniform quality, free from blowholes, hard spots, shrinkage distortion, cracks, unusual roughness, or other defects. Use traffic type castings with a minimum weight of 340 pounds, unless otherwise noted on the Drawings.

Provide castings generally as detailed on the Drawings. Use shear ring type frame. Machine castings for non-rocking fit. Furnish bolt down covers and gaskets where required. Provide bituminous coating on frame and cover.

Manhole Steps:

Use 12-inch wide, cast iron manhole steps with "non-slip" tread and bituminous coating, complying with OSHA regulations.

Precast Concrete Manholes:

Use precast concrete manhole sections conforming with ASTM C478 in the size indicated on the Drawings. Unless otherwise noted, use concentric top cones for 48-inch manholes and eccentric top cones for larger manholes. Provide flat tops where specifically required. Use precast bottom sections with openings for all connecting lines accurately cast at the factory. Cast manhole steps in the Section walls at the factory. Space steps at 12 inches on center and align so that steps and opening form a continuous vertical ladder. At contractor option, use either O-ring or mastic joint materials provided by the manhole manufacturer.

Remove from the site manhole sections that are cracked, chipped, or blistered, or having excessive porosity, exposed reinforcing, or other damage.

When requested by the Contractor, cast-in-place reinforced concrete bases may be used in lieu of precast bases, subject to The Engineers' approval.

PART 3 - INSTALLATION:

General:

Set drainage structures plumb on a 6-inch gravel blanket.

Construct drainage structures as detailed on the Drawings.

Remove any precast sections with cracks, chips, blisters, exposed reinforcing, honeycomb, or other damage or defects as instructed by the Resident Inspector, regardless of origin of damage or defects.

Align and/or set manhole steps to form a continuous vertical ladder below the top access.

Carefully seal openings around pipes with brick and mortar, nonshrink grout, or hydraulic grade cements as necessary to eliminate any leakage. Plaster around pipe to provide a smooth, uniform appearance.

Install gaskets between precast concrete sections in accordance with manufacturer's instructions, using proper lubricant and/or other items required. Plaster exterior, above-grade joints with mortar to provide a smooth, uniform appearance.

Set manhole frames and covers in full mortar bed. Plaster around exterior of frame and cover to provide a smooth transition to the drainage structure.

Construct inverts of concrete, mortar, and brick to provide smooth uniform flow channel as indicated on the Drawings.

Eliminate all visible leakage of fluid into or out of drainage structures.

Remove and replace drainage structures or component parts damaged during construction.

Refer to the related work specifications sections for earthwork and surface restoration.

Manholes:

Construct manholes from materials indicated on the Drawings.

Plaster interior of masonry manholes, if any, with mortar to form a smooth, uniform surface from the invert to 6 inches above the highest inlet. Plaster the exterior of masonry manholes from the ring and cover to 12 inches below grade.

Where manholes are set in pavement, adjust cover elevation to be flush with finish pavement surface. Select proper manhole height so that a maximum of three courses of brick are required for adjustment.

SECTION 3A0

CONCRETE WORK:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This section applies to cast-in-place reinforced concrete work. Work includes the following:

Furnishing and testing concrete mix designs
Formwork
Furnishing and placing reinforcing
Furnishing and placing concrete
Finishing concrete surfaces
Curing
Modifying existing concrete structures
Grouting

The extent of concrete work is indicated on the Drawings.

Related Work specified elsewhere:

Earthwork,	Section 2B1
Pumping Equipment,	Section 13W3

REFERENCE SPECIFICATIONS:

ACI 347-68,	"Recommended Practice for Concrete Formwork".
ACI 318-77,	"Building Code Requirements for Reinforced Concrete".
ACI 304-73,	"Recommended Practice for Measuring, Mixing and Placing of Concrete".
ASTM C94-74a,	"Ready Mixed Concrete".
ACI 306-66	"Recommended Practice for Cold Weather Concreting".
ACI 305-72,	"Recommended Practice for Hot Weather Concreting".
ACI 315-74,	"Manual of Standard Practice for Detailing Reinforced Concrete Structures".
ACI 350-77,	"Concrete Sanitary Engineering Structures".
CRSI,	"Recommended Practice for Placing Reinforcing Bars".

SUBMITTALS:

Submit data evidencing compliance with the Contract Documents for the following:

- Concrete Mix Design
- Deformed reinforcing bars
- Welded wire fabric
- Grout

PART 2 - MATERIALS:

CONCRETE MATERIALS:

Use ready-mix concrete complying with ASTM C94 composed of the following:

Portland Cement: ASTM C150-74, Type I.

Fine Aggregate: Natural sand, ASTM C33-74. Gradation in conformity with Georgia Department of Transportation Specifications is acceptable.

Coarse Aggregate: Crushed Stone or Gravel, ASTM C33-74, 1 inch maximum size.

Water: Clean and potable, free of oils, acids, salts, organic matter or other deleterious substances.

Air Entraining Admixture: ASTM C260-73, certified free of chlorides.

REINFORCING:

Deformed Bars: ASTM A615-72, Grade 60 (60,000 PSI).

Welded Wire Mesh: ASTM A185-73. Minimum mesh for slabs supported on grade, No. 6 at 6 inches each way.

Bar Chairs and Supports: Provide in number, length, and spacing conforming to CRSI 65. Furnish with galvanized legs where bearing on exposed surfaces of concrete.

Ties: Annealed wire not lighter than No. 16 gauge.

CONCRETE ACCESSORIES:

Dovetail Anchor Slots: 26 gauge or heavier zinc coated steel formed approximately 1 inch x 1 inch with removable filler.

Premoulded Bituminous Expansion Joint Filler: ASTM D1751-73.

Joint Filler: ASTM C1850-74.

Waterstops: Polyvinyl Chloride, 6 inches wide, with center dumbbell for expansion joints only, plain center elsewhere.

Vapor Barrier: Polyethylene Film 4 mils (.004") thick.

FORMS:

Structural Members: Provide studs, walers, sills, beams, shores, and falsework, adequate for the loads imposed, in materials of the Contractor's selection.

Ties and Accessories: Use form ties of type to leave clean-cut holes not larger than 3/4 inch diameter and to leave no metal within 1 inch of the finished concrete surface.

Provide ties with a positive waterstop projection at the center of the wall for all retaining walls and walls below liquid level in sumps or trenches.

Use adjustable steel clamps for columns and column piers.

Form Facings: Use steel facings only for surfaces not exposed to view in the finished work. Face all forms for exposed surfaces with plywood not less than 5/8 inch thick or 1/4 inch thick lining of tempered hardboard, specifically processed to resist moisture.

Form Coating: Form oil for steel faced forms and rough board forms; A. C. Horn Company "Formfilm", or Maxwell and Hitchcock "Formlac" or equal, for plywood forms or hardboard faced forms.

MIX DESIGN:

Proportion concrete to produce minimum 28 day compressive strengths as follows:

All concrete, unless otherwise noted: 4000 PSI

Provide mixes designed by an independent testing laboratory in accordance with ACI 304-73, with trial mixes prepared and 100 percent of at least three test cylinders for each mix testing out not less than 125 percent of the specified minimum strength, in accordance with appropriate ASTM standards. Provide at least one mix design for each class and type concrete specified. Design mixes within the following parameters:

Minimum Cement Factor: 6.5 sacks of cement/cubic yard.

Maximum Water Content: 5.5 gallons/sack of cement

Air entrainment: 5 to 9 percent for aggregate 1/2 inch or smaller
4 to 6-1/2 percent for aggregate larger than 1/2 inch.

Slump: 2 to 4 inches.

Existing mix designs and current verification tests may be used in lieu of new tests when acceptable to the Engineer.

Provide revised mix designs when actual concrete furnished fails to produce required strength or exhibits other undesirable qualities.

Regardless of laboratory recommendations, provide concrete which meets the specified strength requirements.

PART 3 - CONSTRUCTION:

GENERAL:

Perform concrete work in accordance with the reference specifications.

FORMING:

Construct forms to produce concrete masses true to the shapes, lines, and dimensions shown on the drawings. Construct forms sufficiently tight to preclude leakage of mortar. Maintain accuracy within the following tolerances:

Variation from plumb in corner columns, control joing grooves, and other conspicuous lines: 1/4 inch in one story of 20 feet maximum.

Variation from plumb in other vertical lines and surfaces: 1/4 inch in 10 feet; 3/8 inch in any story of 20 feet maximum.

Variation of building lines and related positions of columns, walls and partitions from established position in plan: 1/4 inch in any bay of 20 feet maximum; 1/2 inch in 40 feet or more.

Variation in cross sectional dimensions of columns, beams, floors, and walls: 1/4 inch minus; 1/2 inch plus.

Provide all shores and bracing necessary to support the concrete in its plastic state, and to carry safely all loads imposed by the concreting operation.

Brace or tie forms together to maintain position and shope during concreting operations.

Seat shores on firm solid bearing to preclude settlement during concreting.

Monitor forms during concreting and curing until required strength is attained. If undue settlement or distortion occurs, stop the work, remove any permanently damaged portions, and strengthen the falsework before continuing.

Maintain original shores under any floor from which forms for a floor above are being supported, or reshore in accordance with the recommendations of A.C.I. 347. Keep such shoring or reshoring in place until the floor cast latest has attained sufficient strength to permit form removal.

Retain formwork until the concrete is sufficiently strong to sustain its own weight and all loads likely to come upon it.

During favorable curing conditions (when the concrete is kept above 50 degrees F.) keep supports in place for the following minimum periods:

Centering under beams	14 days
Floor slabs	7 days
Walls, columns, beam sides and all other parts	2 days

Remove forms with care not to damage the surfaces of the concrete. Do not, under any circumstances, use metal bars to pry forms from the faces of concrete.

Before reuse, recoat oiled contact surfaces; retouch abrasions as necessary but do not recoat lacquered surfaces.

REINFORCING:

Fabricate reinforcing in conformity with ACI 315 and ACI 318.

Make all bends cold. Discard all bars with kinks or bends not shown on drawings.

Bundle and tag all bars for ready identification.

Protect bars in storage from deposits of rust, mud, or other coatings detrimental to bond.

Place reinforcing accurately in accordance with the Drawings, and provide positive support in conformity with CRSI 65 recommendations.

Observe placing sequence and tolerances of CRSI recommended practice.

Tie reinforcing securely at intersections.

Lap splices as indicated on the Drawings, or if not indicated, use a minimum lap of 36 bar diameters.

Use lapped splices for bars up to size No. 11. Use welded splices for larger bars, unless otherwise noted.

Lap mesh reinforcing at least one space.

Clean any rust, hardened grout, mud, or other deposits from bars prior to pouring.

CONCRETE:

Install embedded items prior to beginning concrete placement.

Position all embedded items accurately and give them positive support before start of concreting.

Check with all trades operating under the Contract and permit them to place embedded items at the proper time.

Provide sleeves for all pipes passing through floors or walls. Use cast iron sleeves for all pipe below grade, from 4 inches to 24 inches in diameter. Use schedule 40 steel pipe sleeves for larger penetrations and standard weight galvanized pipe sleeves for smaller penetrations unless otherwise noted. Provide sleeves the full thickness of the concrete.

Provide dovetail anchor slots for anchorage of facing or abutting masonry.

Place slots vertically, spaced 2 feet apart for facing masonry and where required to anchor wall ends.

Place slots not less than 4 inches from any parallel edge of concrete unless dimensions of work force closer placing.

Mix and transport ready-mixed concrete in accordance with the provisions of ASTM C94.

In job batched concrete, mix each batch of 2 cu. yds. or less a minimum of 1-1/2 minutes.

For larger batches, increase the time by 15 seconds for each additional cubic yard or fraction thereof.

Place concrete by using methods which prohibit segregation.

Do not transport concrete by pumping unless the pumping equipment has been approved, in writing, by the Engineer. In particular, do not use any pumping equipment which permits the concrete to make contact with pumping components or piping made of aluminum.

Deposit concrete in layers of 1 foot or less to keep construction level.

Space and ram concrete, working it around reinforcement and embedded fixtures and into all angles.

Use mechanical vibrators to insure complete filling of all voids. Do nto use vibrators to move concrete. Vibrate new concrete into freshly poured concrete to at least six inches depth. Do not place concrete which has received its initial set.

Use tremies or "elephant trunks", or provide "windows" in form work to limit vertical drop to 4 feet.

Make chutes of metal. Slope not more than 6 inches per foot.

Scrape and roughen concrete surfaces which have received initial set and remove scrapings before placing new concrete against such surfaces.

Thoroughly clean and wet old concrete surfaces and cover them with 3/4 inch of mortar (of the same portions used in the concrete) before placing new concrete against them.

Hold large aggregate away from forms in these locations to keep open seams from showing.

In temperature above 80 degrees, observe all recommendations of ACI 605.

Do not place concrete when temperature is 40 degrees F. or below, or likely to fall to that level within 24 hours, unless methods to maintain higher temperature in the concrete have been proposed by the Contractor, approved by the Engineer, and put into force. Employ methods recommended in ACI 306.

Regardless of outside temperatures, hold the concrete at 50 degrees F. or more for 7 days after placing.

Place slabs checkerboard fashion to prevent bonding of concrete across construction joints.

Clean and square the edges of previously cast concrete before placing new concrete against it. Do not tool joints.

Patch all cold joints, cavities left by form ties, and other voids and imperfections, within the same day that forms are removed. Honeycomb also may be patched unless of such magnitude as to make the strength of the structure questionable.

Prepare cavities for patching by cutting out to a depth of at least 1 inch without feather edges. Wet cavities and surrounding areas within 6 inches and paint cavities with neat cement grout immediately before patching.

Use a mix of Portland cement and sand in same proportions used in the concrete being patched. Blend sufficient white Portland cement into the patching mortar to insure that the patch, when finished and cured, will match the concrete in color. Hold mixing water to a minimum and stir mortar with a trowel at intervals, without adding more water, for one hour, before using.

Compact mortar thoroughly into voids leaving patch a little high until after initial shrinkage.

Finish patches to texture of adjoining surfaces and keep wet for 7 days.

Finish concrete surfaces as indicated on the Drawings, or, if not indicated, as herein provided.

Where floor drains are provided and/or slopes are indicated by elevations or graphics, finish surfaces to drain without any local pockets, low points, reduced thickness, or other detrimental features.

Provide the following general finishes:

Common Finish, for unexposed surfaces such as foundations to be concealed by backfill, furred vertical surfaces, and soffits above suspended ceilings. Fill all tie holes, honeycomb, and other voids or depressions. Otherewise, leave surfaces in the texture imparted by the rough forms.

Plywood Finish, for all exposed surfaces not specified to receive "Smooth Rubbed" or other special finish.

Cast concrete against forms having plywood sheets or liners of large size arranged in an orderly and symmetrical pattern.

Remove fins, patch tie holes and other voids or depressions, and leave surfaces in the texture imparted by the form surface.

Smooth Rubbed Finish: Cast concrete against plywood or lined forms as for "Plywood Finish". After removing finish and patching voids and depressions, rub the entire exposed surface with carborundum stone and water to a completely uniform color and texture. Perform this operation without the addition of any cement grout, slush or plaster to any part of the surface at any stage of finishing.

In addition to surfaces indicated on the drawings, produce smooth rubbed finish on the following surfaces:

- Equipment pads and foundations
- Exterior foundation walls exposed above grade
- Exterior exposed spandrel beams
- Exterior and interior exposed columns

Provide the following finishes as required:

Provide integral finish as indicated on the Drawings for floors, ramps, stairs, etc.

Compact the concrete thoroughly to true planes with screeding equipment and do no further manipulation of the surface until the concrete begins to harden.

Do not, under any circumstances, dust on dry cement or sand to take up excess moisture.

As soon as the concrete will bear the weight of equipment, compact the surface with tamping mechanical floats

Then re-check the surface with a 10 foot straight edge, removing humps and filling hollows. Re-compact adjusted areas with the tamping floats.

Follow the floating with power troweling, and continue until a dense, impervious surface is produced true to designed planes within the tolerances specified below.

Complete the operation with hand troweling, continuing until the surface has a uniform sheen and is free of trowel marks and other blemishes.

Hold all finished elevations within 1/8 inch plus or minus of required planes. Allow no more than 1/8 inch difference between the highest and lowest points to be found under a 10 foot straight edge placed anywhere. Leave floor free of any waves or dips of short pitch.

Finish resilient floored areas indicated on the Drawings by mixing and placing as required for integral finish.

After screeding, use spiked tamper or "jitterbug" to push coarse aggregate below surface.

Compact the surface with tamping mechanical floats and immediately rod the surface in two directions at right angles with a 10 foot straight edge removing all humps and hollows. Trowel hard and smooth.

Visual trueness of surface is the prime requirement. Any irregularities sufficient to be apparent in the surface of the applied covering will because for rejection.

Finish surfaces of structural slabs not otherwise indicated, by their intended use. Screed surfaces intended to receive cement setting beds to true planes and scrape free of laitance or scum. Roughen mechanically for bond as soon as they will bear the weight of workmen. For surfaces intended to receive roofing or waterproofing membranes, hand-float smooth after screeding. Do not depend on bull-floating to produce smooth surface.

Finish exterior paving, after compacting and floating, by belting or brooming to produce a uniform non-slip finish to match a previously prepared and approved sample.

Finish outside sidewalks to a smooth floated finish of granular texture. Avoid dense slick troweling. If pattern of sidewalk joints is not shown, space cross joints (of full depth) at intervals not exceeding 1-1/4 times the width of walk. Provide expansion joints not more than 40 feet on centers, and at backs of curbs if sidewalks abut paved areas.

Finish curbs and gutters with a "smooth rubbed finish" on exposed vertical surfaces and as specified for "outside sidewalks" for exposed horizontal surfaces.

Finish unformed surfaces at tops of formed masses to match adjoining surfaces.

At tops of surfaces with "Common Finish" screed surface to a plane surface and leave.

At tops of vertical surfaces with "Plywood Finish" float the surfaces to true planes.

At the tops of surfaces with " Smooth Rubbed" finish, float the tops to true planes, and rub the surface to match adjoining vertical surfaces.

Cure and harden all floors as soon as the freshly finished floor will bear the weight of workmen, by applying one coat of Guardian Chemical Co. "Clearbond" or Momar Chemical Company "Claro-Coat", or equal. After final cleaning at completion of job, apply a second coat.

Construct joints as indicated on the Drawings. Locate joints only as indicated on the Drawings or as approved in writing by the Engineer. Request any proposed joint changes in the form of submittals. Provide the following joint types as required:

> Provide construction joints as detailed on the Drawings. Install construction joints at all joint locations not otherwise designated. Install waterstop where indicated or required to prevent leakage into finished areas or out of liquidholding areas.
>
> Use either plastic water-stops of 6 inch wide strips or crimped 20 ounce copper through all construction joints in self-supported slabs over used spaces.
>
> Use extreme caution in installing waterstop to maximize watertightness of the structure. Use additional means, such as sealant, caulking, etc., acceptable to the Engineer, as required to comply with the "structure leakage" provisions of the General Requirements.
>
> Construct expansion joints where indicated on the Drawings. For slabs, use premoulded filler, 1/2 inch thick, extending from bottom of slab to within 1/2 inch of finish elevations. Point top 1/2 inch full and level with joint filler.
>
> Before application of joint filler, be sure joints are dry cleaned of scale, dirt, dust, curing compound, or foreign matter.
>
> Locate against walls at perimeter of floors where slabs are at or above outside grade.
>
> Do not use around areas smaller than 2000 square feet, or areas entirely below grade, or areas receiving tile.

Locate, also, as shown in exterior paving. Install premoulded filler full depth of paving, and omit joint filler at top. Where not shown, place joints against all building walls, and not more than 40 feet on centers each way in the field of paving.

Provide isolation joints consisting of two plies of 30 pound roofing felt, folded with folded edge up, extending full depth of slab, or use premoulded joint filler as indicated.

Locate only at perimeter of columns or column piers, unless shown elsewhere.

Install control joints at required slab locations by either using prefabricated filler strips or saw cut joints providing a notch in the concrete approximately 1/8 inch wide, extending from the finished surface to a depth of 1/5 of the slab thickness.

TESTING:

Provide one set of 4 test cylinders for every 100 cubic yard, or fraction thereof, for each type or class concrete poured per day. Prepare cylinders in accordance with ASTM C3-69. Perform one slump test, at the pour location, in accordance with ASTM C143-71, for each sample of concrete used for making cylinders. Make and store cylinders in areas or enclosures which provide protection and means for proper field curing, such as heated, enclosed boxes, isolated from vibration. Do not disturb "green" cylinders.

Mark sides of cylinder or mold with date of pour and reference number which correlates to pour information. Mark any cylinders damaged or disturbed. Fill out cylinder cards (may be furnished by the testing laboratory) indicating date, location of pour and sample, reference number, slump, time of batching and sampling, and other information required. In addition, keep a daily log, recording quantities of concrete used in each class, and identifying locations of concrete placed. Perform additonal tests as required by the Resident Inspector to demonstrate compliance with the Specifications.

Carefully transport cylinders to the testing laboratory at the earliest acceptable time. Have cylinders stored, cured, and tested in accordance with ASTM C192 and C139. Unless otherwise required, test one at 7 days, two at 28 days, and one reserve. Have testing laboratory report test results directly to the Engineer.

Employ the testing laboratory to sample concrete and prepare and handle test samples when instructed by the Engineer to ensure sampling and testing in accordance with the reference specifications.

SECTION 4A

BRICK AND BLOCK WORK

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Submit samples of each type of masonry units to the Architect/Engineer for approval before purchase of any materials.

c. Keep one set of approved samples at the job site to be used as a standard for any units delivered for installation.

d. Use type or types of mortar specified under MORTAR Section.

e. Erect a sample panel 6 feet long by 4 feet high of each type of wall construction to show the proposed color range, texture, bond, mortar joint and workmanship.

Do not proceed with masonry work until the Architect/ Engineer has approved the panel of work involved.

f. Handle all masonry units with care to avoid chipping faces or edges.

g. Give all units adequate protection from weather, staining and contact with the ground.

h. Do not erect masonry work when ambient temperature has dropped below 45 degrees F. unless it is rising. In ambient temperatures below 40 degrees, provide enclosures and temporary heat adequate to maintain 50 degrees or more within the enclosure until the mortar is set and cured at least 2 days.

i. Consult with other trades and make provisions that will permit the installation of their work in a manner to avoid cutting and patching. Build in work specified under other sections, as necessary, and as the work progresses. Build in flashings, flashing blocks, expansion bellows, access panels and other work at locations indicated on the drawings.

j. Lay masonry plumb, true to line, with level, accurately spaced courses. Keep bond plumb throughout. Lay corners, reveals, plumb, true.

02 MATERIALS:

a. Brick:

Gray Facing Brick: ASTM C216-75a, Grade MW, Type FBX,

Furnish all units with specified finish one face and one end, and with remaining sides smooth textured but unfinished.

b. Block:

Concrete Masonry Units: ASTM C90-75, Grade N-I, made with either heavy-weight or lightweight aggregates. If lightweight, provide high-pressure autoclave curing and furnish laboratory certification of linear drying shrinkage (ASTM C426-70) not exceeding 0 03 percent.

Cement Brick: ASTM C55-75.

c. Accessories:

Wall Ties: No. 4 gauge wire, solid bronze or copper clad steel, "Z" shaped, of length approximately 1-1/4 inch less than finished thickness of wall, each end bent 2 inches.

Cavity Wall Ties: No. 4 gauge steel "Zee" bars crimped for drip at center of cavity, two inch legs, copper or zinc coated steel, 1-1/2 inches shorter than thickness of wall.

Wire Ties: 9 gauge copper or zinc coated steel wire, looped at both ends.

Joint Reinforcement: Prefabricated truss type or ladder type zinc coated wire, coating Class 1, ASTM A116-73 Side wires 9 gauge or larger, deformed; cross wires 12 gauge or larger, plain or deformed, butt welded to side wires; two inches narrower than wall thickness. Furnish in flat bundled lengths, not in rolls.

d. Cleaning Materials:

For Face Brick: Consult the Brick manufacturer and employ the product which he recommends as most suitable for successful cleaning of his brick. Obtain the recommendation in writing, and record it with the Architect/ Engineer.

03 LAYING UNIT MASONRY;L

a. Laying Brick Work:

Shove brick into place (do not lay) in full mortar bed. Fill completely horizontal, vertical joints, with mortar when and as laid. Make vertical joints of same width except for small variations required to maintain bond. Back joints against concrete or other construction (except in cavity walls); slushed, grouted, or shoved full as course is laid.

Lay face work in courses spaced accurately with a story rod, with better face of brick exposed and with vertical joints intended to align centered truly above each other.

Anchor or tie brick facing work built over backing where bonding is not feasible. Use wire mesh or other approved ties, at least one tie for every 2 square feet of unbonded facing. Extend ties 4 inches into backing and to within 1/2 inch of facing joint exposed surface.

Lay exposed exterior brickwork with joints tooled concave. Unless otherwise noted, construct mortar joints about 3/8 inch wide. Do no tooling until after mortar has taken its initial set. For interior brick which is not to receive plaster or other covering, strike joints flush.

Install wicks of 5/16 inch soft cotton clothes line on not over 3 foot centers over all concrete foundation walls, spandrel beams and all lintel or shelf angles, and all through-wall flashings. Where wall is solid, extend wicks to within 2 inches of inside face and connect with a continuous lateral wick the full length of the wall. Where the wall is constructed of units having hollow cells, extend wicks to center of the cells and connect with a lateral. After the walls are complete, cut off the wicks flush with the outside face of the wall.

b. Laying Concrete Block:

Erect concrete block back-up, walls, and partitions of thickness and where indicated on the drawings.

Unless stacked vertical joints are indicated, locate vertical joints above the centers of the blocks in the course below. Bed face shells solidly in mortar and fill head joints solidly for the full depth of the face shells. Lay block to 2 courses in 16 inches.

Tool mortar joints in exposed work with a concave joint tool slightly larger than the width of the joint.

Bond each course at corners and intersections. Bond into or anchor to adjacent construction with metal anchors 2 feet apart.

Wedge partitions tight to slab soffits and beams and fill joints at top with mortar.

Continuous joint reinforcement specified shall be laid in alternate horizontal joints of all block walls and partitions. Lap ends 6 inches at splices.

c. Veneer Wall Construction:

Erect walls of cavity or veneer construction where indicated.

If entire face of back-up is to be dampproofed, complete inside wythe and wait to construct veneer until dampproofing is in place.

Separate facing and back masonry completely by continuous air space of width shown.

Bond two wythes together with cavity wall ties spaced 2 feet on center vertically and 1 foot on center horizontally. Position cavity wall ties within 8 inches of jambs of openings.

Keep air space between facing and back-up clear, clean of mortar droppings, using a movable wood strip laid on wall ties. Lift strip out carefully before next row of ties or anchors are placed.

Provide weep holes and wicks as specified under brickwork.

d. Related Construction:

At all pressed metal and structural door frames, slush jambs and head full of mortar as block courses are laid up.

04 CLEANING:

Lay up work in as clean a manner as possible. Remove excess materials and mortar droppings daily.

Point all holes in exposed masonry. Cut out defective joints and repoint with mortar. Tool to match surrounding joints.

After pointing has set, clean all exposed shale or clay masonry by hosing down thoroughly and scrubbing thoroughly with stiff fiber brushes. Re-wet until all suction of the masonry is satisfied. Then apply the cleaning detergent specified. Allow detergent to stand for approximately 3 minutes and scrub with stiff fiber brushes. Wash thoroughly with clean water. Mix detergent as recommended by the manufacturer for the specific brick used. If wall does not come clean, repeat a second time.

Rub down all walls, scheduled for painting, with brick to remove all projections and to provide smooth surfaces for painting.

SECTION 4B

MORTAR

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Applicable Standards: Mortar for Unit Masonry: ASTM C270-73. Follow "Proportion Specifications" of C270 for each type of mortar scheduled herein.

c. Store cement, lime and air-setting mortars in watertight sheds with elevated floors.

d. Do not use any anti-freeze agent in mortars.

02 MATERIALS:

Portland Cement: ASTM C150-777.

Slag Cement: ASTM C595-76.

Masonry Cement: ASTM C91-75.

Hydrated Lime: ASTM C207-76, Type S.

Sand: ASTM C144-76.

Water: Clean and free of deleterious amounts of acids, alkalies or organic materials.

03 MORTAR TYPES:

a. Types are as defined in ASTM C270-73.

For Brick and Concrete Block: Type N, either one part Masonry Cement and three parts sand, or one part slag cement, one part lime putty, and six parts sand.

04 MIXING MORTARS:

a. Do mixing in mechanically operated batch mixers in which water can be accurately, uniformly controlled. Allow at least five minutes mixing time, two minutes for mixing dry materials and three minutes mixing after water has been added. Do not exceed rated capacity of mixer. Empty mixer completely before placing succeeding batch therein.

b. Mix cementitious materials and aggregate with amount of water consistent with satisfactory workability.

c. Use method of measuring materials on job so that specified proportions of mortar materials can be controlled and accurately maintained during work progress.

d. Keep mixers and transporting equipment clean. Do not deposit mortar upon ground or permit contact with ground.

e. Prepare mortars in which Portland and other quick-setting cements are used in batches of volume that will be used before initial set takes place, in no case longer than 45 minutes before delivery to masons' mortar boards at points of use or no longer than 2-1/2 hours from initial mixing. Re-tempering is not permitted.

SECTION 5A

STRUCTURAL STEEL

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Furnish all structural steel shown on drawings fabricated and erected.

c. Applicable standards:

> The CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES of the American Institute of Steel Construction, adopted SEPTEMBER 1, 1976.
>
> SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS of the American Institute of Steel Construction adopted February 12, 1969, for design of connections, and workmanship in fabrication and erection.
>
> AWS STRUCTURAL WELDING CODE-STEEL of the American Welding Society, D1.1-79.
>
> SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 or A490 BOLTS, approved by Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, February 4, 1976.

d. Shop Drawings: Submit shop and setting drawings and schedules to the Architect/Engineer in accordance with GENERAL REQUIREMENTS, carrying the initials of shop drafting room checker on first submission. Cross reference all details to applicable details on the Contract Drawings. Do not use reproductions of Contract Drawings as setting drawings.

Approval on shop drawings applies to general arrangement of work and not to the accuracy of figured dimensions, nor shall it relieve Contractor of responsibility for errors and/or omissions in shop drawings or schedules.

e. Welding: Employ only certified welders holding current certificate by a recognized approving authority. Submit evidence of certification to the Architect/Engineer.

02 MATERIALS:

Structural Steel: ASTM A36-75. Submit copies of mill reports to the Architect/Engineer showing all chemical and physical characteristics.

High Strength Bolts, Nuts, and Washers: ASTM A325-76c/

Unfinished Bolts: ASTM A307-76b, Grade A.

Welding Electrodes: AWS A5.1 or A5.5, E70XX for A36 steel.

Shop Paint: Sherwin-Williams Kem Kromik Metal Primer No. B50N2, Pittsburgh "Ironhide" Primer No. 8-2, or duPont Rust Resistant Primer No. 785.

03 FABRICATION:

Fabricate steel in accordance with cited Code and Specification.

Conform to AISC Specification with all connections not detailed.

Fabricate connections or type of field connectors specified.

Mill all column bearings.

Punch all members as indicated for attached building materials.

Weld all shop connections.

Before shop paint is applied, have all shop welds inspected by a testing laboratory approved by the Architect/Engineer.

See MATERIALS TESTING section for terms of employment of the laboratory.

Furnish all bolts, bearing plates, anchors, anchor bolts, and other accessory materials necessary for complete job of erection.

Ship column anchor bolts and approved setting drawings in advance of fabricated steel, in time for setting in concrete foundations.

Paint steel in accordance with AISC Specification. Keep surfaces to be embedded in concrete free of paint. Otherwise, paint all surfaces of steel, including portions intended to be concealed in the finished building. Keep work free of dust during painting. Do not paint damp surfaces. Do not paint in the open air in rainy or freezing weather. If paint is damaged by cold or wet, remove it and apply new paint.

04 ERECTION:

Provide and maintain all necessary temporary guying of the steel frame to resist all wind loads during erection and to assure proper alignment of all parts of the steel frame.

After steel framework is erected and aligned, wedge column bases to proper elevation and grout solidly with portland cement grout.

Use not more than 1-1/2 cubic feet of sand for each sack of cement in grout and use minimum water to produce mix of dry pack consistency. Pack the space under each plate completely full with grout free of voids. After grout is set, remove wedges and patch the resulting voids in the grout. Do not use leveling nuts with base plates unless previous written approval has been obtained from Architect/Engineer. Back-off leveling nuts, if used, after grout is set.

Make all field connections with A325 bolts except where notes on the drawings permit common bolts.

Make high tensile bolt connections of bearing type. If "Turn of Nut" method of tightening is selected, use clearly marked impact wrenches for counting turns. If calibrated torque wrenches are used, re-calibrate wrenches at least twice daily.

Before erection, clean and repaint all spots where shop coat is damaged, rusted or otherwise destroyed.

After erection, paint all bolts, field welds, unpainted areas around connections, and spots damaged in field handling.

Use same paint as used for shop coat.

SECTION 5B

MISCELLANEOUS METALS

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Applicable Standards:

1. Specification for the Design Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction.
2. Standards of the Aluminum Association.

c. Provide all bearing plates, lags, inserts, rivets, bolts, and other fasteners necessary to hold miscellaneous metals in place.

d. Submit shop drawings for all miscellaneous metal items specially fabricated for this project.

Th extent of Miscellaneous Metal work is indicated on the Drawings or described herein.

02 MATERIALS:

Structural Shapes: ASTM A36-70a.

Zinc for galvanizing shall conform to ASTM B6 (70).

Threaded Fasteners: ASTM A307-68, Grade A for steel. Use SS fasteners for all aluminum.

Aluminum: Alloy 6063-T6 or 6061-T6 as noted.

03 FABRICATION AND INSTALLATION:

a. Fabrication: Observe provisions of Section 23 of cited AISC specification.

b. Shop Paint: Coat all surfaces not embedded in concrete with:

Refer to Section 9A material to be used for shop paint.

Coat all aluminum in contact with concrete with zinc chromate coating system.

c. Hot Dip Galvanizing:

Where items are specified to be galvanized, the galvanizing shall conform to ASTM A123-73 and shall be capable of withstanding a four dip Preece test made in accordance with ASTM A239-73.

Galvanizing shall be done after fabrication. Steel shall be prevented from warping during galvanizing in accordance with recommendations of the American Zinc Institute.

If galvanized coating becomes marred, paint with zinc paint as recommended by the American Zinc Institute. Touch up surfaces shall match surrounding zinc coating.

d. Provide all items fabricated of rolled shapes, bars, pipes, tubing or plates. The following paragraphs supplement information given on the drawings for some such items, but items for which drawing information is fully descriptive are not necessarily named.

Loose Lintels: Where not detailed, one 5" x 3-1/2" x 5/16" angle for each 4 inches of wall thickness, bearing 12 inches at each end, for openings up to 6'-0" in width.

Grating: Use bar grating with heavy duty bearing and cross bars sizes to support a superimposed working live load of 100 PSF over the actual span, with deflection limited to L/360. Install plumb and true to exact lines and levels and in proper relation to other work. Band perimeter and all openings in grating sections. Provide separate sections as indicated on the Drawings. Provide grating seats and fastening devices to secure grating. Design fasteners so that there is no projection above the walking surface of the grating. Coordinate grating with the work of other trades.

Use aluminum I-bar grating unless otherwise noted. Use galvanized steel grating where specified or welding to steel is required.

Checkered Plate: Use steel or aluminum checkered plate as indicated; McKinley, Flockhart, or equal.

Thresholds: Use five inch wide abrasive thresholds; Wooster No. 115-S, or equal.

Extend thresholds full width of door openings in a single piece and neatly fit around jams of door frames. Set in sealant. Provide thresholds for all doors unless otherwise noted.

Aluminum Pipe Rails:

Furnish and install welded aluminum handrail as indicated on the drawings.

All aluminum handrail shall be constructed of 1-1/2 inch I. D. Schedule 40 aluminum pipe. Aluminum shall be alloy 6063-T6. Close all ends and form joints accurately with welds ground smooth and buffed to be practically invisible. Submit sample of joint and obtain approval before fabrication. Finish aluminum with clear anodized finish.

For stairs, fabricate rails accurately to the rake of stairs. Secure walls rails with adjustable brackets of type most appropriate to wall material.

For rails mounted on concrete, set sleeves at least 4 inches long into concrete and caulk vertical posts into the sleeve.

e. Wrap all pipe rails in protective plastic before shipment.

Curb Angles: 5" x 3-1/2 x 5/16" at platform edges and 4" x 4" x 1/4" elsewhere if sizes and shapes are not given on the drawings. Provide anchors not more than 18 inches on center and within 6 inches of each end. Set flush with concrete. If bumpers are required at platforms, weld top row of bolts to angles.

All miscellaneous iron, steel, aluminum and stainless steel work not specifically specified in other Sections of the Specifications but shown on the drawings and as required to complete the work shall be furnished and installed under this Section.

Aluminum Tread Plate: Alloy 6061-T6 with raised diamond or similar non-slip pattern.

Aluminum Structural Shapes: Alloy 6061-T6.

Alloy 6063-T6 may be used for welded construction, subject to Engineer's approval.

Safety Chain: 3/8 inch cadmium plated proof coil with snap lock on one end. Provide cadmium plated eyebolts for each end and cold shuts or other hardware as required.

SECTION 5C

METAL STAIRS

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. In the absence of specific sizes shown on drawings, select sizes of members to support safely a uniformly distributed live load of not less than 80 pounds per square foot.

c. Anchor posts and railings to withstand a horizontal thrust of 35 pounds per lineal foot applied horizontally to the top rail.

d. In layout of stairs, take careful account of varying thicknesses of finishing materials at landings, and make all finished riser dimensions precisely uniform within each story height.

e. Submit shop drawings of stairs and obtain approval before fabrication.

f. Approved Manufacturers:

For Cast Abrasive Treads:

American Abrasive Metals Company
American Mason Safety Tread Company
Wooster Products, Inc.

02 MATERIALS:

a. Aluminum: Alloy 6061-T6.

b. Aluminum Tread Plates: Alloy 6061-T6 with raised diamond on similar non-slip pattern.

03 FABRICATION:

a. Build stringers of structural shapes.

b. Where so indicated, provide cast abrasive treads with integral lugs for bolting to stringers, with back lip, and with reinforcing truss rib. Minimum thickness, 1/2 inches, similar to American Abrasive, style RK. Cast platforms with nosings to match treads.

c. Where so indicated, provide treads and platforms of all welded grating with 1-1/4 inch cast abrasive nosing, similar to Borden style W/B with bearing bars of size selected to support 80 psf or more on the spans indicated with deflection of less than 1/240 of span.

d. Handrails are specified under Pipe Rails in Miscellaneous Metals Section.

04 INSTALLATION:

a. Erect stairs accurately to provide plumb risers and level treads and platforms in the finished work. Provide temporary wood fillers for treads to protect nosings until permanent fill material is placed.

SECTION 6A

ROUGH CARPENTRY

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Applicable Standards:

Federal Specification TT-W-571g, for recommended practice, preservative treatment.

Trade Association Grading Rules:

Douglas Fir: West Coast Lumbermen's Association.

Southern Pine: Southern Pine Manufacturer's Association.

c. Provide certificate of inspection for all lumber from grading association having jurisdiction or lumber bearing association grade mark.

d. Provide certification of specified treatment from the approved treating plant.

e. Moisture Content: Maximum at time of installation 19%, unless otherwise hereinafter specified.

f. Stack framing and other rough lumber to insure proper ventilation and drainage. Cover and otherwise protect it from the elements.

g. Verify the accuracy of, suitability, placement and positioning of all anchors required for attachment of items to the work of other trades.

02 MATERIALS:

a. Water Borne Preservative Salt Treatments: Either Fluor-Chrome Arsenate Phenol Mixture, TT-W-535 at 0.35 pound per cubic foot, or Acid Copper Chromate, TT-W-546 at 0.50 pound per cubic foot. Do not use chromated Zinc chloride. Apply water borne preservative salts to all lumber.

b. Lumber:

Nailers, bucks, etc., "No. 2 Dimension" Southern Pine or "Construction Grade" Douglas Fir, S4S.

c. Other Materials:

Anchors for Wall Plates and Nailers: Standard bolts of sizes and spacing as detailed. Install standard washers of appropriate sizes where bolt heads or nuts bear on wood.

Anchors for Wood to Wood: Standard framing nails or lag bolts of proper sizes for rigid installation.

03 INSTALLATION:

a. Framing:

Anchor nailers, bucks, blocking, etc., to concrete, steel and masonry as indicated on the drawings. Make connections secure at all bearing points. Back prime all wood surfaces coming to contact with steel members.

SECTION 7A

DAMPPROOFING IN WALLS

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Construct dampproofing courses of trowel mastic within the thickness of exterior walls both with and without embedded flashing. The drawings designate trowel applied mastic as "dampproofing" and treatment with embedded flashing as "fabric flashing". Solid metal flashings into walls above roof are specified under "BUILT-UP ROOFING, INSULATION, AND TRIM METAL" Section.

c. Employ a Specialty Sub-Contractor for this work having continuous experience in this field for the last ten years.

d. Examine all surfaces to be treated for any voids or protrusions which could cause puncturing of the fabric or treatment. Do not undertake work until such defects have been corrected.

e. Furnish a guarantee, executed jointly by the General Contractor and the Specialty Sub-Contractor, against leakage of dampproofing treatments for a period of five years, including cost of removal and replacement of any finishing materials which have to be removed for access to the areas of leakage.

02 MATERIALS:

Asphalt Primer: ASTM D41-73.

Trowel Mastic: Heavy bodied fibrated asphalt mastic for cold application, non-sagging in application on vertical surfaces to thickness of 1/8 inch or more, and guaranteed not to bleed and stain adjoining masonry. Acceptable products: Johns-Manville "Asbestile", Toch Brothers "R.I.W. Marine Mastic, D&D Formulation".

Fabric Flashing: "Phoenix Copp-R-Flash", Type "B", manufactured by Phoenix Building Products Company, "Wasco Cop-R-Tex Duplex, Plus Lead" of American Cyanamid Company, "Lead Copper Kraft" of Sandell Manufacturing Company, Inc., each with a combined weight of lead and copper not less than 5 ounces per square foot.

03 INSTALLATION:

a. Fabric Flashing: Where "Fabric Flashing" is noted on the drawings, trowel on a 1/16 inch coat of trowel mastic and embed fabric in mastic.

Press fabric tightly in contact with mastic. Leave no voids or air bubbles. Bend sharply and fit closely into re-entrant angles so that masonry laid on completed treatment shall neither puncture the fabric nor disengage its upper edge from reglet or flashing receiver. Lap cross joints in fabric 4 inches and bed in mastic.

Flash fabric positively to preclude all possibility of water seeping between back of fabric and face of backing material.

Install fabric flashing continuous at floor lines, continuous lintels, continuous sills, sash angles or other running members. Install discontinuous fabric flashing at sills and lintels of isolated openings 6 inches beyond jambs and turn up at ends to form a pan.

Extend fabric substantially to the outside face of walls unless otherwise detailed.

Install fabric reinforcing angles where continuous treatments are pierced by columns. Seal carefully to column faces and to fabric flashing above and below treatment to insure watertightness.

b. Dampproofing: Where faces of steel or concrete spandrels are noted "Dampproofing", give beams a 1/8 inch thick coat of mastic, lapping over the fabric flashing below and under the fabric flashing above.

SECTION 7B

BUILT-UP ROOFING, INSULATION AND TRIM METAL

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. This section covers bituminous roofing, roof insulation, and related trim metal.

c. Manufacturer's bond is not required. Provide a written guarantee from the approved roofer covering the watertightness of his entire work for a period of three years from completion of the building.

d. Acceptable manufacturer is The Koppers Company, Inc.

A roofer approved by the manufacturer approved for the project shall install the work.

e. Examine all work in place which is to receive roofing. Do not start work on surfaces which are dusty, dirty, wet, damp, unsound, damaged, or otherwise unsuitable to receive and support roofing materials. Examine the height of curbs, flashing receivers and other elements in place to be sure that space available is correct for installation of base flashings of height acceptable to the roofing manufacturer. Report all defects to those responsible, and do not perform work over uncorrected defects.

f. Submit for approval, manufacturer's detailed specifications for each type of roofing proposed as meeting the requirements of this specification.

g. Submit shop drawings for approval covering all items of sheet metal specially fabricated for requirements of this project.

02 MATERIALS:

a. For Vapor Barriers and Roofing Membranes:

Asphalt Primer: ASTM D41-73

Asphalt: ASTM D312-71, Type III.

Asphalt Saturated Felts: ASTM D226-75, Unperforated.

Coal Tar Saturated Felts: ASTM D227-56.

Coal Tar Pitch: ASTM D450-71, Type A.

Coated Base Sheet: Heavy rag felt, asphalt saturated and coated both sides, with total weight between 42 and 45 pounds per 100 square feet.

Roofers' Cement: Federal Specification SS-C-153, Type I.

Roofing Aggregate: ASTM D1863-64, Gravel or Slag only.

b. Insulating Materials:

Mineral Insulating Board: Johns-Manville "Fesco" board, or Celotex Corporation "Celo-therm", in boards 24 inches by 36 inches or 24 inches by 48 inches and of thickness shown.

c. Sheet Metal Materials:

Aluminum Sheet: Alcoa "Alclad" Sheet 3003 or equivalent of Reynolds or Kaiser.

Sheet Lead: Four pounds per square foot, minimum.

Stainless Steel: ASTM A167-74, Type 304, extra soft temper, equal to Washington Steel Company "Microflex".

Galvanized Metal: Copper bearing steel zinc coated, acid etched, equal to Armco "Paintgrip".

03 SYSTEMS:

a. Vapor Barriers:

On monolithic concrete decks, two layers 43 pound coated base sheet, solid mopped.

b. Insulation:

Single layer mineral insulating board with tapered insulation as called for.

c. Roofing Membranes:

Over insulation, one layer 43 pound base sheet and 3 plies of coal tar felts, mineral aggregate.

d. Sheet Metal Selections:

Cap Flashings: 2 gauge stainless steel

Conductor Heads: .031 aluminum

Downspouts: .031 aluminum

Flashing Receivers: 26 gauge stainless steel

Gravel Stops: 26 gauge stainless steel

Flanges for Roof Drains and Vent Stacks: Sheet lead at least 24 inches square extending at least 8 inches outside drain clamp.

04 APPLICATION:

a. Work in General:

Apply roofing materials only on clean and dry surfaces. Do not start work, any morning, until all traces of overnight dew or frost have disappeared.

b. Handling Bitumens:

Provide separate kettles for asphalt and coal tar pitch, or burn out kettle completely clean after use with one type bitumen before use with the other.

Keep asphalt temperature in kettle above 400 degrees F., but never above 450 degrees. Hold asphalt at point of use between 375 degrees and 400 degrees. In cold weather, provide insulated transporting equipment for asphalt if necessary to hold temperatures within specified ranges. In weather too cold for the specified temperature ranges to be maintained, stop the work.

Keep coal tar temperature in kettle above 350 degrees F., but never above 400 degrees. Hold coal tar at point of use between 325 degrees and 350 degrees. In cold weather, provide insulated transporting equipment for coal tar pitch if necessary to hold temperatures within specified ranges. In weather too cold for the specified temperature ranges to be maintained, stop the work.

Spread a complete film of bitumen in each application. Broom felts to eliminate all voids and air pockets. Avoid leaving bare patches on either surface of mopped felts.

Apply all felts and bitumen by hand methods. Do not use felt laying machines or mechanical bitumen spreaders.

c. Application of Vapor Barriers:

Solid prime monolithic slabs in preparation for mopping of vapor barrier base sheets.

Cut coated base sheet in 18 foot lengths, and lay two plies lapped one half width plus 1 inch. Lap ends 4 inches and stagger end joints between plies. Lay base sheets in solid moppings of asphalt (30 pounds per square) and solid mop within all laps. Run in same direction as felts in finished roofing.

Terminate all plies at vertical surfaces of eave nailers, curbs, walls, or any pipe, ducts, or other protrusions through the roof deck.

d. Placing of Insulation Over Rigid Decks:

Sweep the surface of the vapor barrier of all dust, dirt and standing water. If water is present, allow surfaces to dry thoroughly before installing insulation.

Heavily mop the vapor barrier surface with asphalt at the rate of 35 pounds or more per square.

Apply insulation board by sliding it in the hot asphalt to secure complete bond. Bring boards to close contact at all joints.

Apply no more insulation at one time than can be covered with permanent roofing the same day. Do not apply insulation to wet surfaces. DISCARD any board insulation which becomes wet or damp from any cause.

After each day's work, install a temporary water cut-off, two mopped plies of 15 pound felt,sealed to the roofing surface and the vapor barrier. Remove the cut-off before resuming work.

e. Application of Roof:

Over roof insulation apply one base sheet bedded in steep asphalt, with end laps of 6 inches and side laps of 4 inches. Follow with 3 plies of 15 pound felt lapped 25 inches and bedded in coal tar pitch. Bed mineral aggregate in a flood coat of pitch. Spread aggregate before underlying felts start to curl.

At all edges of roofing felts not turned up cant strips, envelope the edges of felts in 2 plies of felt set in roofers' cement, or set felts on sheet metal angles turned up into crown of gravel stop, or take other positive precautions to prevent pitch dripping into the building or down the face of the building. Include all openings and pipe penetrations in these precautions.

f. Base Flashings:

Flash against vertical walls and curbs with multiple layers of abestos felt and reinforced flashing sheet, bedded in roofers' cement and finished with coating of manufacturers recommendation for 20 year construction.

g. Sheet Metal Workmanship:

Form all sheet metal items to sharp and uniform profile. Hem all exposed metal edges. Make finished work watertight and weathertight. Lap seams in direction of flow. Solder single lock seams on vertical or steep surfaces at least 4 inches and bed in roofers' cement.

Conceal fasteners wherever possible. Use cleats locked into seams or edge hems. Do not face nail in exposed locations. Where face nailing is unavoidable use large headed nails through over-sized holes centered in dimple depressions and cover nail heads with soldered metal discs about 2 inches in diameter.

Isolate dissimilar metals from contact with each other. Apply a coat of spar varnish or asphaltic paint on contact surfaces or interpose a sheet of roofing felts.

Provide for expansion movement without losing watertightness. At horizontal or near horizontal surfaces, such as expansion joint caps, provide watertight free moving joints not over 25 feet on centers. Lock and solder intermediate joints.

h. Sheet Metal Items:

Conductor Heads: Form to profile shown with watertight joints. Lock and solder to scupper outlet. Provide tailpiece to downspout fitted with basket strainer of No. 14 wire.

Gravel Stops: Form to profile shown with not less than 4 inch extension of back flange onto roofing surface.

Downspouts: Fabricate downspouts to dimensions and section shown, with lock joints. Fit top end closely around outlet above. Anchor with bar straps not more than 8 feet apart secured with bolts and expansion shields to masonry or concrete or with equally positive fasteners to any other materials. Make lower end straight or with elbow.

Cap Flashings: Form cap flashings to overlap base flashings at least 4 inches and to extend almost to the top of the cant. Bend near center to provide spring action against base flashing. Form top edge to interlock with flashing receiver formed on edge of through-wall flashing or other previously built-in member.

Special Flashings: Provide all other flashings shown or noted, but not named above.

SECTION 7C

SEALANTS

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

02 MATERIALS:

a. Sealants:

Silicone Rubber: Dow-Corning "Sealant no. 780" or General Electric "Silicone Sealant".

One-Component Polyurethane: Dow-Corning "Terraseal", Toch Brothers "Polytok Sealant R.M.".

Caulking Compound: Oleo-resinous caulking compound, gun grade, light gray, equal to Pecora Caulking Compound, conforming to Federal Specification TT-C-598.

b. Primer: As recommended by sealant manufacturer.

c. Joint Backing: Untreated Oakum for oleo-resinous caulking; expanded, closed cell, polyethylene rectangular sections cut from sheet for other sealants.

03 INSTALLATION:

a. Deliver, store and handle materials to prevent inclusion of foreign material or damage of materials by water or breakage. Deliver and store packaged materials in original packages until ready for use. Do not use packages of materials showing evidence of water or other damage.

b. Prime porous materials with primer by brush application, before installation of sealing compound.

c. Wipe non-porous materials clean with mineral spirits before installation of compound.

d. Apply sealant with a pressure hand gun. Seal openings to a minimum depth of 1/2 inch and a maximum depth of 3/4 inch. Where spaces around openings are deeper than 3/4 inch, pack with backing up to this depth prior to sealing.

e. Dress down sealant and leave joint free from fins, ripples and overlaps, perfectly bonded to frame and masonry sides. Leave sealed joints weathertight.

f. Immediately clean adjacent materials which have been soiled. Leave work in neat, clean, condition.

04 SCHEDULE:

a. Silicone Rubber for:

Joints between masonry and other materials.

Masonry Control Joints.

b. One-Component Polyurethane for:

Joints in walking surfaces.

c. Oleo-Resinous Caulking Compound for:

Interior Door Frames.

SECTION 7D

WALL LOUVERS

01 GENERAL REQUIREMENTS:

GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

02 MATERIALS:

Aluminum Extrusions: Alloy 6063-T5

03 FABRICATION:

a. Workmanship:

Conceal fasteners wherever possible. Do not face nail in exposed locations.

Isolate dissimilar metals from contact with each other. Apply a coat of spar varnish or asphaltic paint on contact surfaces or interpose a sheet of roofing felt.

Provide for expansion movement without losing watertightness.

b. Fixed Louvers:

Aluminum, formed or extruded, as detailed, of following thickness: blades .081", and frames .081".

Construction: Turn blades down 1 inch on outside face and up 1 inch on inside face, arranged to form a weathertight job.

Assemble to frames with watertight welds.

Provide, for face of fixed louver, 1/2 inch mesh wire screen in removable frame.

04 SELECTIONS:

a. Standard of Quality:

Fixed Louvers: Airolite No. K6386

SECTION 8A

METAL DOORS AND METAL FRAMES

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. This section describes fully operating hinged doors of gauge metal installed in place, including gauge metal frames for all types of doors requiring them. Install all operating hardware with doors.

c. Fit all doors and hardware and install, and adjust using skilled mechanics and leave in perfect operating condition.

d. Give all industrial steel doors and metal frames under this section one coat of metallic primer, baked on, before shipping from factory.

02 INDUSTRIAL STEEL DOORS:

a. Construct with 18 gauge stretcher leveled steel face sheets and one piece honeycomb internal reinforcement, equal to products of Manufacturing Division of Republic Steel Corporation; Ceco Corporation; or Steelcraft Manufacturing Company; similar to 1-3/4 inch thick Regent doors of Ceco.

b. Arrange glass lights and louvers as indicated on the drawings. Use louvers equal to Ceco 4631.

c. Machine and reinforce for hardware during manufacture. Reinforce adequately for support of doors without sag or distortion.

03 PRESSED STEEL DOOR FRAMES:

Form frames for industrial doors of pressed steel, as detailed, of 16 gauge, except that head members for openings more than 3'-4" wide shall be 14 gauge. Machine and reinforce frames at factory for hardware. Provide anchors for frames, of types appropriate for each condition of installation. Drill frame for three rubber silencers on the strike edge for single doors and two silencers for the head of all double doors.

Form frames for view windows of same construction as door frames, with applied stops.

04 HARDWARE:

a. Selections are from Ceco Catalog. Similar and equal items standard with other named manufacturers are also acceptable. Furnish US26D, dull chrome finish on items inside toilet rooms, US10, dull bronze elsewhere.

b. Master key all locks into a single system.

c. Where frames are structural steel, mortise hinge leaves double depth into door and use full mortise hinges.

d. Identification of Items:

Hinges:

2212	4-1/2" x 4-1/2" two bearing bronze.

Mortize Bolts:

199	Head or Foot Bolt.

Locks or Latches:

5110	Passage latch.
5321	classroom function.
5411	Push plate and pull on plate, dead bolt by turn piece inside, cylinder outside.

Closers:

3041	Size D. regular arm.
3051	Size E, regular arm.

Holders:

4064	Floor bumper.

Weather Seal:

#22 and #19W Zero

e. Schedule

HW-1

3 Hinges	2212
1 Latch	5321
1 Closer	3051
1 Weather Seal	

HW-2

8 Hinges	2212
1 Latch	5321
1 Headand Foot Bolt	199
1 Weather Seal	

HW-3

6 Hinges	2212
1 Passage Latch	5110
1 Head and Foot Bolt	199
1 Floor Bumper	4064

HW-4

3 Hinges	2212
1 Passage Latch	5110
1 Floor Bumper	4064

SECTION 8B

GLASS AND GLAZING

01 GENERAL REQUIREMENTS

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. Submit samples in duplicate of each type of glass specified to the Architect/Engineer for approval prior to fabrication of any item.

c. Deliver glass to site in containers that will protect glass from the weather and breakage. Store materials carefully in a safe place to reduce breakage to a minimum.

d. Deliver glazing compounds in unopened labeled containers bearing manufacturer's names and brand identifications.

e. Do not perform glazing work when surrounding temperature is below 40 degrees nor during damp or rainy weather.

f. Identify each piece of glass with manufacturers labels showing glass type, thickness and quality and allow labels to remain until glass has been set and inspected.

g. Determine actual sizes to which glass must be cut from measurements taken of the frames at the job site. Perform all cutting and edge polishing of heat strengthened glass at the factory. Do not perform any trimming or edge nipping after shipment from the factory.

02 MATERIALS:

a. Glass Materials: Furnish glass complying with Federal Specification DD-G-451c(2) as applicable. Glass type are as follows:

Clear Wire Glass: Polished plate, 1/4 inch thick with baroque mesh for glazing.

Putty: Conforming to Federal Specification TT-P-791a, Type I. Whiting Putty or Type II White Lead-Whiting Putty for glazing in interior wood frames.

Glazing Sealant: One part acrylic terpolymer.

Glazing Tape: Polyisobutylene preformed, reinforced tape.

03 INSTALLATION:

a. Apply putty, glazing compound, glazing sealant, glazing tape and gaskets uniformly with accurately formed corners and bevels. Remove excess compound from glass and sash. Use only recommended thinners, cleaners and solvents. Do not cut or dilute putty, glazing compounds or sealants not without approval from Architect. Make good contact with glass and frame when glazing and facing off. Do not set glass in wood or steel frames until frames have been primed and paint is dry. Do not apply any compound or sealant at temperatures lower than 40 degrees F. or on a damp, dirty or dusty surface. After glazing, doors and ventilators in ash shall be fixed so they cannot be operated until compound has set. Remove any excess sealants from glass and adjoining surfaces during the working time of the material; within 2 to 3 hours.

b. Employ stop bead glazing with a combination of glazing sealant and extruded vision strips be used for securing glass in metal frames of exterior glazing except where extruded vinyl is employed. Apply as folows:

1. Apply glazing tape against the fixed stop and extending from base of rabbet to sight line when compressed. Place setting blocks and spacer shimas required. Press glass firmly into tape with a slight lateral movement.

2. Apply a heel bead of glazing sealant in space between edges of glass and frame and overlapping on glass face a minimum of 1/4 inch; apply heel bead at sill section only.

3. Secure stop beads in place. After the heel bead of sealant has taken its initial set, back fill the glazing space to site line of stop bead with extruded vision strips. Strip excess tape and compound from glass and frame. Tool compound and trim or tool tape at a slight angle to shed water and produce clean straight sight lines.

c. At completion of work, all glass shall be free from cracks and other defects not allowed by the specifications. Any defective glass that may appear before acceptance, or within the 1-year warranty period (that is a direct result of manufacturing, transporting or the performance of the contractor), shall be removed and replaced with new glass without cost to the Owner.

SECTION 9A

PAINTING

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This Section includes all materials and labor necessary to complete the painting as specified below. The Contractor shall be entirely responsible for all painting at the site in accordance with these specifications and to the satisfaction of the Architect/Engineer. Materials and procedures specified in this section supersede those requirements, if any, specified elsewhere.

MATERIALS:

Material for use in this work shall be delivered in unbroken original containers bearing the manufacturer's name, and they shall be mixed and applied in conformance with the manufacturer's specifications and directions.

All painting materails shall be checked in at the job by the Resident Inspector. One copy of all delivery tickets shall be turned over to him, and no materials will be allowed on the job which he has not inspected on delivery, and for which he does not have a delivery ticket. Containers shall not be removed from the premises without being checked out by the Resident Inspector.

PART 2 - PRODUCTS

APPROVED MANUFACTURERS:

The painting schedule below lists three approved manufacturers. Paint manufactured by other specialty paint companies which is of similar composition to that specified, which is of equal merit may, with the approval of the Architect/Engineer, be used. All paint selected for use under this Contract must be the product of a single manufacturer throughout the job, providing complete systems from primers through finish coats.

PAINTING SCHEDULE:

LOCATION	Indural Coatings, Inc. Birmingham, Alabama	Koppers Co., Inc. Pittsburgh, PA.	Themec Co., Inc. N. Kansas City, Missouri
Structural & Misc. Steel & Iron (Interior & Exterior) Clean per SSPC SP-6 Commercial Sand Blast	Shop & Field prime coats; Indural H-1175 Rust Inhib. Prime 1.5 dry mils, Finish: 2 coats Indural rush inhibitive metal finish, 2.0 dry mils per coat	Field Primings: 1 coat No. 622; 1.5 dry mils Finish: (Exterior): 2 coats Glamortex Enamel; 1.4 dry mils per coat. Finish" (interior) 2 coats Ponkote Enamel; 1.4 dry mils per coat.	Shop/Field priming-1 coat #77 Chem-Prime 2.1 dry mils; Finish-1 coat #66 Hi-Build Epoxoline 4.0 dry mils
Machinery, Piping & Pumps (interior & exterior) Clean per SSPC SP-6 Commercial Sand Blast	Interior: Shop prime 1 coat Indural H-1175 Rust Inhib. Primer at 1.5 dry mils Finish: 2 coats Rust Inhibitive Metal Finish, 2.0 dry mils per coat	Field Priming: 1 coat No. 622; 1.5 dry mils Finish: (Exterior): 2 coats Glamortex Enamel; 1.4 dry mils per coat. Finish: (interior) 2 coats Ponkote Enamel; 1.4 dry mils per coat.	Shop/Field priming-1 coat #77 Chem-Prime 2.1 dry mils; Finish-1 coat #66 Hi-Build Epoxoline 4.0 dry mils
Bituminous Coated Cast Iron Pipe & Fittings (non-submerged)	2 coats presto seal Sealer at 1.0 dry mil per coat 2 coats Industrial Indurlux 2.0 dry mils per coat.	Field sealing: 2 coats Inertol Tar Stop 1.2 dry mils Finish: 2 coats Ponkote Enamel: 1.4 mils per coat.	2 coats #707 Tar Bar. Finish: 2 coats Tneme-Gloss, 1.5 dry mils per coat.
Galvanized surfaces (where required)	Indurall H4-1109 Systems Wash Coat Primer	Koppers 40 Systems Wash Primer	2 coats #66 Hi-Build Epoxoline 4.0 dry mils per coat

LOCATION	Indural coatings, Inc. Birmingham, Alabama	Koppers Co., Inc. Pittsburgh, PA.	Tnemec Co., Inc. N. Kansas City Missouri
Steel and iron submerged or in contact with water Clean per SSPC SP-10 near white sand Blast	Shop: 1 coat Ruff Stuff Epoxy Primer at 2 dry mils, Finish: 2 coats Ruff Stuff Epoxy #3300 10 dry mils per coat	Shop: No. 654 Epoxy Prime 1.5 dry mils Finish: 2 coats Bitumastic No. 300 M 5.0 dry mils per coat	Shop/Field priming-1 coat #77 Chem-Prime 2.1 dry mils Finish: 2 coats #66 Hi-Build Epoxoline 5.0 dry mils per coat.
Non-Galvanized ferrous piping	Primer: 1 coat Ruff Stuff Epoxy Primer at 2.0 dry mils, Finish: 2 coats Ruff Stuff #2100 Coal Tar Epoxy at 10.0 dry mils per coat	Prime: 30 metal conditioner Finish-2 coats 300M 5.0 dry mils per coat	2 coats #66 Hi-Build Epoxoline 5.0 dry mils per coat
Structural Misc. Iron not encased in concrete but inaccessible after erection Clean per SSPC SP-6 Commercial Sand Blast	2 coats J-1129 Thick N'Quick Mastic at 10.0 dry mils per coat	Shop Primer: 1 coat No. 622; 1.5 dry mils or Field Primer: 1 coat No. 626; 1.5 dry mils Finish: 3 coats No. 49 thick; 1.2 dry mils per coat	2 coats #66 Hi-Build Epoxoline 5.0 dry mils per coat
Interior Masonry Walls, Concrete beams & ceilings & Dry Wall Partitions.	1 coat Induron P-1120 Surfacer 2 coats Perma-Clean Finish Coat, 1.0 dry mil per coat	Primer: 2 coats Torex 830 under-coater 1.0 dry mil per coat. Finish: 1 coat Torex 800 Ramuc Util. Enam. 1.0 dry mil	] coats of Tneme-Cryl 2.3 dry mils per coat
Interior Floors (Operating level only)	--	2 coats Glamorglaze @ 1.75 dry mils per coat	2 coats Tneme-Tread, 2.3 dry mils per coat

All linseed oil, turpentine, dryer, shellac, and othe related products shall be furnished by the paint manufacturer.

PART 3 - EXECUTION:

SAMPLES:

The exact color, shade of color or tint for all work herein is to be given later and the decision shall rest entirely with the Engineer who will select the colors, shades or tints from color cards and panels which the Contractor shall prepare and submit for approval. The Contractor shall make all necessary corrections in the samples submitted, as required by the Engineer, and shall pay all costs arising from the preparation, shipping or mailing of samples.

PROTECTION:

No interior painting shall be done until the building is enclosed and heated except in dry summer weather. At all times the building shall be well ventilated where the paint is being applied in order to prevent condensation. The paint, especially the finish coat, shall be applied when the air is free from moisture or dust, always allowing each coat of paint to dry hard before applying the next coat.

The Contractor shall furnish and place drop cloths in all areas where painting is being done to protect floors, piping and other work during the painting periods. Where it becomes necessary, in order to execute the work, for the painter to remove coverings placed by others in any branch of the work, he shall replace same, or in case they cannot be replaced, he shall protect the work in some other satisfactory manner. Oily rags and waste shall be removed from the buildings every night and under no circumstances be allowed to accumulate.

PREPARING SURFACES FOR PAINTING:

All masonry surfaces to be painted shall be cleaned and given one coat of neutralizing zinc sulphate before painting. The solution shall be mixed using 2 to 3 pounds of zinc sulphate to 1 gallon of water. After applying this solution, it shall be allowed to dry and then brushed to remove any loose undissolved crystals.

All metal surfaces shall be cleaned in accordance with the provisions of the current Surfact Preparation Specification of the Steel Structures Painting Council, to the degree required by the manufacturer of the prime coat material in his current literature.

Cleaned metal surfaces shall be primed or painted immediately after cleaning to prevent any new rusting. Galvanized surfaces to be painted shall be cleaned and treated, in accordance with the manufacturers instructions before the application of any paint or coating. Polished surfaces and surfaces that have a high grade factory enamel finish meeting the approval of the Engineer shall be left unpainted. On any equipment painted, the Contractor shall completely mask and carefully preserve all attached data and characteristic plates.

If any painted surface discolors due to the surface being improperly prepared, it shall be repainted at the Contractor's expense.

WORKMANSHIP:

All workmanship shall be of the very best, with all materials evenly spread and smoothly flowed on. All surfaces to which paint or finish is to be applied shall be absolutely clean and dry. No outside painting shall be done in extremely cold, frosty, or damp weather. No painting or finishing shall be done in dusty rooms. If the painting is done in cold weather, sufficient heat shall be used to bring the temperature up to 50 degrees F. or more. On all tinted painted surfaces, the next to the last coat shall be tinted different from the final coat. All painting on the job shall be done by the same painting subcontractor unless, in the opinion of the Engineer, the painting subcontractor is unsatisfactory and the Engineer requests his removal. The Engineer shall be furnished, before work is commenced, a written approval of the painting subcontractor by the manufacturer of the approved paint, and all work shall be done under the supervision of the paint manufacturer's representative.

PIGMENTS:

Color pigments may be added at the job to match samples of the finishes desired by the Engineers. All mixing of colors shall be done before paint is thinned out.

PAINTED SURFACES:

The following surfaces and items shall be painted in accordance with the foregoing instructions:

1. All items of equipment, machinery, pumps, and piping, including all electrical work.
2. Structural steel, and miscellaneous metals.
3. Other work as indicated on the Drawings or elsewhere in the Contract Documents.

FACTORY FINISHES:

Where factory finished or installer finished items are installed with finish intact and finish is acceptable to the Resident Inspector, painting may be deleted.

SECTION 10A

TOILET ROOM ACCESSORIES

01 GENERAL REQUIREMENTS:

a. GENERAL and SUPPLEMENTARY CONDITIONS, and GENERAL REQUIREMENTS (Division 1) shall govern all work under this Section.

b. This section includes all accessory items in Toilets.

c. Install all items in locations as indicated and in strict accordance with the manufacturer's instructions.

02 MATERIALS:

a. Mirrors and Shelves, constructed of Type 302 Stainless Steel with satin finish. Frame, 20 gauge stainless steel with heliarc welded corners, ground and polished smooth. Mitered corners or rivets will not be permitted. Shelf, 22 gauge stainless steel attached to mirror frame will not be permitted. Unit equipped with concealed wall hanger and theft-proof locking device. Mirror, 16 inches by 24 inches. Shelf, 5 inches clear depth and 16 inches wide. Mirror glass, 1/4 inch polished plate glass.

b. Toilet Paper Dispensers, double roll rust proof, heavy chrome plated, die cast non-ferrous alloy, one arm each roll, hinged for refilling, and equipped with a tension device to prevent spinning of the roll.

c. Liquid Soap Dispensers: Bobrick Model B12CP.

d. Paper Towel Dispenser: Bobrick Model B-262.

SECTION 13B

PROCESS CONTROLS AND INSTRUMENTATION:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DEXCRIPTION OF WORK:

The extent of process controls and instrumentation is shown on the Drawings, and as herein specified. Work includes the following:

Furnishing and installing remote telemetering System.
Furnishing and Installing Control and Instrumentation Panels and Equipment
Furnishing and installing Flow and Level Indicating and Recording Equipment.

Furnish complete control and instrumentation systems including all elements, features and components necessary to reliably accomplish intended functions, smoothly and without hunting or undesirable abruptness, and which are fully adjustable to meet actual installed operating conditions.

Neither Drawings nor other Contract Documents are represented as identifying all features, elements or components which might be required for a properly functioning installation. The vendor represents, however, that he understands the intent of the Contract Documents, and that he possesses sufficient knowledge to, and will in fact, translate such intent into the furnishing of a complete and satisfactory installation.

RELATED WORK SPECIFIED ELSEWHERE:

Process Piping,	Section 13W1
Pumping Equipment	Section 13W3
Electrical	Section 16A

Manufacturer's Experience:

Unless otherwise indicated, furnish all equipment produced by manufacturers regularly engaged in the standard production of the equipment specified. Provide suitable evidence that the manufacturers have engaged in the production of major components of such equipment for at least five years and manufactured systems such as specified which have demonstrated successful operation over a period of at least five years.

Service:

The manufacturers of equipment furnished shall have a factory-trained and authorized qualified service technician stationed in the immediate project area. The name, address, and telephone number of the service technician shall be included with submittals and operation and maintenance literature.

Reference Standards:

Perform all electrical and mechanical aspects of the work in conformance with the Instrument Society of America (ISA) Standard Practices Code, the Joint Industrial Council (JIC) standards, and the National Electrical Code (NEC).

WARRANTY:

Warranty or guarantee from each manufacturer covering all systems, subsystems, and components furnished by said manufacturer, for a period of one year from the date of final project acceptance.

Start-Up Assistance:

Provide a minimum of one day of assistance by a factory-trained manufacturer's representative or serviceman for the process controls and instrumentation furnished. Obtain two copies of signed certificates or letters from the factory authorized representative indicating that the equipment has been installed in accordance with the manufacturer's instructions and recommendations. Do not operate equipment until installation is certified. Test units, and/or place in service in the presence of the factory representative. Calibrate and/or adjust equipment as required for proper operation. Have the factory representative instruct the Owner's personnel in the proper operation and maintenance of the manufacturer's equipment.

SUBMITTALS:

Submit manufacturer's data evidencing compliance with the specifications, including information on materials of construction, performance, dimensional drawings, special requirements, and other data. Include manufacturer's recommendations for installation, start-up, operation, and maintenance. Provide copies of warranty and service agreements. Include submittals on the following:

Telemetering system
Flow and Level Recorders
Primary Measurement Devices
Ball Valve Control Panels
Other Instrumentation and Control Devices

Furnish shop drawings for all custom fabricated items. Also furnish independent loop sheets, and composite loop sheet of entire system using ISA diagrams.

As Built Drawings:

Furnish as-built, control and instrumentation schematic diagrams of modified, existing, and new elements of the Project. Prepare diagrams in the "ladder" format with terminals identified corresponding to shop drawings. Include a comprehensive narrative description of each function or operation.

Operation and Maintenance Mateial:

After placing equipment in service and prior to final project completion, furnish six complete sets of unmarked operation and maintenance literature. Include approved as-built drawings, wiring diagrams, parts lists and suppliers, maintenance materials, and complete operation and maintenance instructions.

MATERIAL DELIVERY, STORAGE AND HANDLING:

Deliver controls and instrumentation units cartoned or crated to provide protection during transit and job storage.

Store units in location and manner which protects against dust, moisture and physical damage. Do not proceed with installation until other construction has been completed which would damage controls and instrumentation.

PART 2 - PRODUCTS

INSTRUMENTATION AND TELEMETRY:

Provide an instrumentation and remote telemetering system designed to measure,report and record analog data and sense, and indicate, or control discrete functions. Provide System produced by one manufacturer with all components designed to properly interface to produce a high-quality, dependable, accurate system, System includes primary accurate measurement devices, transmitters, telemetering system, recorders, indicators, totalizers, annunciators, remote control functions, and remote alarm functions. Refer to the Drawings for general arrangement and applicable details. Provide control contacts for related equipment as required.

General:

The Contractor shall furnish and install all instruments, appurtenant equipment, piping and accessories as indicated on the Drawings and/or specified herein. All conduit and wiring between panels and all field mounted devices, between panels, between field mounted devices, and between all instrumentation and power sources shall be furnished and installed under the appropriate electrical sections.

The Contractor's attention is directed to the fact that the instrumentation is an integrated system; and, as such, shall be furnished by one manufacturer who shall provide all of the equipment and appurtenances--regardless of manufacture--and be responsible to the Contractor for satisfactory operation of the entire system. Substitutions on functions specified will not be acceptable.

The Contractor shall coordinate the work of the system manufacturer's service personnel during construction, testing, calibration and acceptance of the instruments.

The supervisory service of a factory-trained service engineer who is specifically trained on the type of equipment herein specified shall be provided for a period of one (1) eight-hour day during construction to assist the Contractor in the location of sleeves; methods of installing conduit and special cable; mounting, piping and wiring of one of each type of device; and the methods of protecting all of the equipment prior to placing it into service. Upon completion of the installation, the services of the above service engineer shall be provided for a period of not less than three (3) eight-hour days for calibration and start-up of the equipment and instructing the operating personnel. The minimum days specified above do not relieve the manufacturer of providing sufficient service to place the system in satisfactory operation.

No form of energy shall be turned on to any part of the instrumentation system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor containing his supplier's authorization for energizing the system.

In order to standardize on existing equipment to maintain parts interchangeability and simplify service agreements, furnish instrumentation and telemetry systems manufactured by BIF/Turbitrol.

Submittals: The Contractor's attention is directed to the following regarding submittals, "as-built" Drawings, and operation and maintenance literature:

1) Submissions for approval shall include:
   a) component manufacturing data sheet indicating pertinent data and identifying each component by item number and nomenclature as indicated on the drawings and in the specifications.

   b) Component drawing showing dimensions, mounting and external connection details. The data sheet and component drawings shall be submitted in accordance with the distribution indicated in the General Specification.

   c) A system piping schematic and wiring schematic each on a single drawing with full description of operation. Component identification on the schematic shall be as indicated above.

2) The schematic drawings shall be submitted in duplicate copies on transparent reproducible paper. Following approval, the manufacturer shall be responsible for distribution as required by the Specifications or by the Engineer.

3) All literature and drawings being forwarded for approval shall be bound in two volumes, one for in-line items of equipment and the other for the instruments. Sales bulletins and other general publications are not acceptable as material for approval.

4) Furnish instruction manuals, operating and maintenance instructions and separate parts lists. Instruction manuals shall also incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.

5) Special tools. These shall be a kit which shall contain special size wrenches and other types of tools, not normally available, which are necessary for assembling, disassembling, aligning and calibrating the equipment.

6) After the material has been forwarded for approval, the manufacturer of the equipment shall make available the services of a project engineer, and other qualified personnel as required to assist the Contractor in reviewing submittal with the Engineers.

System Criteria: All of the equipment shall be the manufacturer's latest and proven design. Specifications and Drawings call attention to certain features, but do not purport to cover all details entering into the design of the instrumentation system. The completed system shall be compatible with the functions required and the equipment furnished by the Contractor. Comply with the following:

1. All electrical components of the system shall operate on 120 volt, single-phase, 60 cycle current, except as otherwise noted.

2. All controls for remote electrically operated or motor driven equipment shall be complete, including all necessary auxiliary relays so as to require only wiring and connections to the equipment control circuit. All contacts for control of remote motor operated or electrically operated equipment shall be rated not less than 10 amperes at 120 volts unless otherwise specified herein.

3. All remote motor operated or electrically operated equipment will have a separate 120 volt control circuit.

4. Control wiring for remote operated motors shall be #12 AWG.

5. All necessary fuses or switches required by the instrumentation manufacturer for his equipment shall be provided with the equipment. All instruments requiring an internal power supply shall have an internal ON-OFF switch.

6. The Drawings and Specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the instrument system from these energy sources shall be furnished with the instrumentation.

7. Components shall be finished to the manufacturer's standard for the service intended unless otherwise indicated.

8. All differential sensing devices, such as flow transmitters, shall have a brass bypass and manifold with the device.

9. All components shall be tagged with the item number and nomenclature given in the Specification.

System Piping: All instrument tubing, except as otherwise noted on the drawings or in the specifications, shall be Type L, hard-drawn, copper tubing, conforming to Federal Specification WW-T-799b, for Tube, Copper Seamless, for use with Solder-Tube or Flared-Tube Fittings. Tubing sizes shall be as indicated on the drawings. All hydraulic connections to instruments shall be made with separable fittings.

Vertical or horizontal runs of tubing in close proximity shall be bundled in an acceptable manner. All concealed runs shall run continuously without joints. Installation of tubing to instruments shall be in accordance with the manufacturer's recommendations.

Copper tubing shall be mounted to surfaces by means of copper or cadmium plated tubing racks securely mounted to the surface. It shall be possible to remove any single tube without disturbing other tubing. Tubing entering and leaving concealed areas shall be identified by function in accordance with the identification number given in the instrument schedule. Identification tags shall be copper and secured to the tubing with copper sealing wires.

Field Calibration: All instrumentation shall be calibrated in the presence of the Engineer in accordance with the range and accuracy specified herein. Certified test reports shall be filed with the Engineer.

Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer.

Spare Parts: The Contractor shall furnish one year's supply of charts and ink for each recording device.

The Contractor shall furnish one set of standard recommended spare parts as indicated in the manufacturer's instruction manuals, for each type of instrument in the system.

The Contractor shall also furnish the following non-standard spare parts:

1) A standby mercury supply for one transmitter in the quantity required.

2) One of each type of etched or printed circuit board.

3) One of each type of chart drive mechanism.

4) One-half dozen indicating lights for annunciator.

5) One-half dozen indicating lights for control and switch stations.

6) One box of fuses.

7) One signal selector - BIF Model 258-08.

8) Two spare relays for each type used.

Test Equipment:

1) Electronic Test Kit - BIF Model 258-12

2) Volt-Ohm-Amp Meter - BIF Model 258-13

3) Mercury Manometer - BIF Model 30EB25 with 18" scale range, complete with mercury supply.

System Description:

It is the intention of these specifications along with the sub-system descriptions witin these specifications to define the specific performance requirements of the systems. It is not intended that these sheets supply all design information required for manufacture and installation of the control system.

In the development of these specifications, no attempt has been made to detail every accessory device such as signal transducers, isolators, amplifiers, etc., that might be necessary for the final system design. It shall be the responsibility of the systems supplier to include in his system design all such devices and components that might be required for proper operation of the system as required by these specifications.

Provide the following subsystems for the telemetering system between the Middle Oconee Raw Water Station and the City of Athens Water Treatment Plant, using leased telephone circuits:

1. Station Flow: Measure station flow using a Venturi (FE-101) and a differential pressure transmitter (FIT-101). Transmit to the Water Treatment Plant via tone and display on an indicating recorder (FIR) and totalize with receiver (FZ-101).

2. River Level: Measure river level with a bubbler system and level indicating transmitter (LIT-102) and transmit via tone to the Water Treatment Plant where it shall be displayed on an indicating recorder (LIR-103). In addition, river level shall be displayed on three separate indicators (LI-103, 104, 105). Use adjustable pressure switches to provide contacts for level controls as indicated on the Drawings as described herein.

3. Pump Bay Level: Measure pump bay level on each of three (3) pump bays using a bubbler system and level indicating transmitter (LIT-103, 104, 105). Transmit via tone to the Water Treatment Plant and display each level on a separate indicator (LI-103, 104, 105). Provide control contacts for differential level between river level and pump bay levels using adjustable differential pressure switches.

4. Remote Controls: Remotely start, stop, and report back status for the raw water pumps (VTP1-1,2,3), and spray pumps (VTP1-4,5.6). Provide push button stations and indicator lights at the Water Treatment Plant, and operate contacts at the Raw Water Station to remotely start and stop equipment. Provide relays at the raw water station which when connected to the motor starter relay contacts, will activate remote run-off indicator lights at the Water Treatment Plant. Use frequency shift tone transmission to provide start, stop and report back functions in a maintained contact mode and retain position or loss of signal.

5. Remote Alarms: Transmit remote alarms or status activated by opening or closing contact at the Raw Water Station. Use frequency shift tone signals and 8 point scanners and display alarm on an annuncuator panel.

6. Intercom: Provide voice communication using intercom system which normally transmits from the raw water station.

Telephone Service:

The Owner will arrange with the Southern Bell Telephone Company for the leased telephone lines to be brought to the telemetering station sites to positions as shown on the plans. The Contractor shall tie into the telephone circuits at these points and arrange with the telephone company for any necessary coordination. Lines shall meet or exceed A.T.& T. class 3002 voice grade specifications.

Service And Maintenance:

Contractor shall furnish service and maintenance for the complete instrumentation and telemetry system during the start-up period, the one (1) year guarantee period and shall offer an additional four (4) year service contract.

Upon submittal of shop Drawings for review, a proposed service contract as described herein, shall be submitted to the Engineer. A lump sum price shall be quoted at that time and the contract offered to the Owner. If accepted, the costs will be paid by the Contractor, and the Contract price will be adjusted in the form of a Change Order. The basis for the Change Order shall be the manufacturers quoted price. Contractor's mark up for overhead and profit shall not exceed five (5) percent of manufacturer's price.

Guarantee Period: At any timeduring the one (1) year guarantee period after the date of final acceptance of the Instrumentation and Telemetry System, the Contractor, on-call from an authorized representative of the Owner, shall furnish factory-trained service engineer personnel to repair or replace any faulty equipment, material, or workmanship, or to correct any malfunction of equipment in the Instrumentation and Telemetry System. For this purpose during this one (1) year guarantee period, a minimum of two (2) such service visits of two (2) - 8 hour days each shall be made, accompanied by county maintenance personnel for instructional purposes. If any of this required minimum service time is not needed for repair or replacement of any faulty equipment, material or workmanship or to correct any malfunction of equipment, then the Contractor, on-call from an authorized representative of the Owner, shall use the remaining visit to visits and time by having a factory-trained service engineer perform inspections of the features of the telemetering system and/or instruction of Owner's designated maintenance personnel in proper maintenance of telemeter and tone transmission equipment. All servicing and repair work during this one (1) year period shall be furnished by the Contractor at no cost to the Owner for all labor, parts, travel and other expenses.

Service Contract:

Before final acceptance of the contract work as a whole, the Contractor will offer to the Owner a four (4) years' service contract, in writing, to become effective upon the expiration of the first year's guarantee period.

This service contract shall include a guarantee of all material and equipment in the telemetering system for these additional four years and a total of eight (8) visits or service calls to the Instrumentation and Telemetry System's job site or sites with a total servicing time of sixteen (16) eight (8) hour days. For these service visits or calls, the Contractor shall furnish a factory-trained service engineer for this type of work. It is anticipated that these eight (8) visits or service calls be spread out approximately equally for each of the four (4) years; however, the service contract shall permit the Owner to call for these service visits or calls as he requires this service, and all material, parts, labor, travel and other costs for these visits or calls will be borne by the Contractor, as required, to repair or replace any faulty equipment, material or workmanship, or to correct any malfunction of equipment. A tentative servicing schedule for this four (4) year period following the one (1) year guarantee period and running from the start of the second year after the date of final acceptance of the telemetering system is:

2nd Year - 2 visits as called for, each of 2 - 8 hour duration.

3rd Year - Same as for 2nd year.

4th Year - Same as for 2nd year.

5th Year - Same as for 2nd year (total 16 - 8 hour days)

As stated, this servicing schedule is tentative and flexible and the total on-call service visits and time for this four (4) year period, as covered in the separate service contract shall be made available promptly on demand by the authorized representative of the Owner at any time as required during the four (4) years until completely rendered. Depending on the demand for this service by the Owner, these totals for service visits and hours, to be furnished by the Contractor, may be expended during the early phase of this four (4) year period or the bulk portion of this service may be available for use during the latter phase of this period. Any of this specified time for a visit, not required for needed service or repair work during this four (4) year period, shall be utilized in maintenance instruction of the Owner's designated maintenance personnel.

Instrumentation Components:

Universal Venturi Tube (FE-101): The metering primary shall be of the pressure differential producing type utilizing pure static pressure sensed at the inlet and throat sections, and suitable for raw water service. The inlet section shall be comprised of a cylindrical section, of similar diameter as the pipe, in which the high pressure tap is installed and shall incorporate a hydraulic shape employing at least two vena contractae to condition the flow profile before it enters the throat section. The laying length of the throat shall be at least 0.5 times the throat diameter. The low pressure tap shall be installed in this section. The outlet cone shall be truncated, having an included angle of 10 degrees. The differential pressure shall indicate static pressure change only. Devices employing entire or partial Pitot efforts, amplyfying differential by changing flow direction at the point of sensing pressure, thus introducing unwanted hydraulic noise, shall not be acceptable. The tube coefficient shall be constant for pipe Reynolds number of about 75,000 and greater and independent of beta ratio and line size. The tube shall be constructed of flanged cast iron, ASTM Tentative Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings, Designation A126, Class B. The pressure connection for the inlet section shall be bronze bushed. The throat liner shall be constructed of bronze, ASTM Standard Specification for Composition Bronze or Ounce Metal Castings, Designation B62. The ends of the tube shall be as indicated in the tabulation. The entire tube, excepting the throat liner and pressure connection bushing shall be coated with coal tar paint. The metering element shall not have debris collecting cavities or annular chambers, but shall have a single pressure connection at the inlet and throat. In addition, a bronze vent port and drain shall be included on a 90-degree plane to the metering tap on the inlet section. The approval data shall state and substantiate the value and tolerance of the coefficient, the effect of up and downstream piping configurations, the head loss in % of pipe velocity head and shall provide proof that the coefficient is independent of line size and beta ratio. The accuracy shall be ± 0.5% of actual rate of flow in the flow range indicated in the tabulation. This accuracy shall be substantiated by a two times standard deviation calculation of at least thirty calibrated tube coefficients of different line size and beta ratio tubes. Provide a complete purge water system including piping, valves, strainers, flow indicators, and other devices as indicated on the Drawings or recommended by the manufacturer. The Venturi shall be a BIF Model 181 or approved equal product.

Flow Transmitter (FIT-101): The transmitter shall be actuated by an integral mercury U-tube manometer having provision for field range change for 60-320 inches of water differential. The manometer wells shall be of high tensile cast iron having a capacity of not less than 12 pounds of triple distilled mercury. An internal check valve system shall protect the mercury supply from excessive or reverse differential. The mercury wells shall be equipped with air vent valves and a hydraulic test head for calibration and manifold bypass valve. The manometer shall drive a large diameter, positive positioned float mechanism. The maximum scale differential shall be as indicated in the table. The transmitter shall oeprate on 117 volts, 60HZ through an internal fuse and switch module. The output motion of the manometer shall be coupled to a function generating cam which extracts the exponent of the measurement and produces a linear input motion to the precision rotary differential transformer. The cam shall have a zero adjustment and alignment indication. The linkage between the cam and the differential transformer shall have a self-locking range adjustment and micrometer type zero adjustment. The ac output voltage from the transformer shall be retified, filtered and temperature compensated from 40° to 120° F. with diode and thermistor techniques. The stabilized dc signal shall then be amplified with a linear intergrated circuit to provide one of the following high level output signals 4-20 ma. dc current into output loads from 0 to 600 ohms. The electronic modules shall be contained in a high impact molded plastic housing forming a NEMA 4 enclosure. The wells and electronic components shall mount on a cold rolled steel mounting plate. The mechanism plate shall be finished in charcoal gray and the cover in light beige. The transmitter shall be furnished with a mounting flange for floor stand or wall mounting. The transmitter shall be equipped with a direct reading indicator mounted to the external face of the transmitter cover and read in units as indicated in the table. The transmitter shall be a BIF Model 251-03 or approved equal product.

Bubbler Systems (CDR-102, 103, 104,105): Each Bubbler System shall consist of a Type 316 stainless steel dip tube, a constant differential relay, a rate indicator with adjustable restriction, an air regulator/filter set as described herein. Provide externally adjustable pressure switches on the Bubbler lines to provide all control and alarm contacts for level and differential level as indicated on the Drawings. The output shall be a pneumatic signal directly proportional to the head. All components shall be mounted as indicated on the Drawings.

The maximum head shall be as indicated in the tabulation. The rate indicator shall have a range of 0-2.5 scfh. The bubblers shall be BIF Model 281-06 or approved equal product. Include dip tube adapters from S. S. to copper.

Level Transmitters (LIT-102, 103, 104, 105): Each transmitter shall be direct pressure actuated through a bronze Bourdon tube or beryllium copper bellows. The motion of the sensing element shall actuate the input linkage to the transmitter. The drive linkage shall have a self-locking range adjustment. The maximum scale pressure shall be as indicated in the table. The transmitter shall operate on 117 volts, 60 Hz through an internal switch and fuse module. The output motion of the actuating element shall be mechanically coupled to a precision rotary differential transformer having minimum torque reaction on its actuator. The drive linkage between the element and differential transformer shall have a micrometer type zero adjustment. The ac output voltage from the transformer shall be rectified and applied to a solid state I. C. (integrated circuit) feedback stabilizing circuit with temperature compensation. The output signal shall be 4-20 ma dc into a load of 600 ohms or less. The components shall be contained in a high impact molded plastic housing forming a NEMA 4 enclosure. The transmitter shall be furnished with a mounting flange for floor stand or wall mounting. The mechanism plate shall be finished in charcoal gray and the cover in light beige. The accuracy shall be within ± 1% of the total head over a 10:1 range. The transmitters shall be BIF Model 251-04 or approved equal product. Each transmitter shall be equipped with a direct reading indicator mounted to the external face of the transmitter cover and read in units as indicated in the table.

Indicating Recorder-Receivers (FIR-101, LTR-102): The receivers shall be actuated by a 4-20 ma dc signal as indicated in the tabulation. The electronic circuitry shall be of solid state components. The electronic circuitry shall include an I. C. (integrated circuit) amplifier which receives the dc input signal. The amplified dc signal shall drive a servo positioner by means of a closed loop. The servo shall drive the various readout devices as indicated. All components within the receiver shall be of modular construction with each circuit card plugged into a mother board which shall be wired directly to an internal terminal strip with color coded wire. The circuit shall be equipped with zero and span adjustments. The necessary dc power supply shall be an integral part of the receiver. The entire mechanism shall be mounted on a slide tray with all components completely serviceable from the front of the instrument. Internal wiring shall include an on-off switch and fuse. The case shall be steel with molded plastic door bezel containing a clear plastic door and magnetic latch. The upper border of the window shall display the service legend and the lower border the function, both engraved on white lamicoid with black letters. The case shall be equipped with an integral mounting bracket for mounting to panels and consoles. The receiver bezel shall be equipped with indirect flourescent illumination and a test cord for servicing the receiver while removed from its case shall be furnished for each set of five or less instruments. The instrument case shall be finished in tan, the bezel shall be black. The charts shall be of the strip type, nominally 4" by 4" and driven at 1 inch per hour by a synchronous motor through a toothed belt and sprocket which prevents "slip" or "walk". The chart carriage shall be removable from the front of the instrument without disturbing operation. The inking system shall be of felt tip pen type. The pen indicator shall lift free of the chart automatically when the chart carriage is withdrawn for chart changing. The pen shall be of the replaceable cartridge type with a 90-day ink supply based upon a one inch per hour chart speed. The pen shall have an integral indicator. The indicator shall run vertically beside the chart and be nominally 4" long and have silk screen processed black graduations on white background. The multiplier for readout shall consist of even multiples of ten only. The chart speed and graduations for chart and indicating scale shall be as indicated in the tabulation. The accuracy shall be + 0.5% of full scale over a 10:1 range. The necessary alarm switches, control contacts or retransmission potentiometers shall be furnished as indicated in the tabulation and driven by the servo positioner. The receivers shall be BIF Model 257-01 (IR) or approved equal product.

Totalizer-Integrator (FZ-101): The integrator shall convert electronic signals to a pulse train the frequency of which is proportional to the input analog voltage. The pulse train shall drive a stepping motor coupled to a counter to provide a totalizer readout of flow. The integrator shall include a zero drop out circuit which can shut off the counter at predetermined low flow rates. The input shall be any of the standard SAMA electrical signals. Input signals and input impedances shall be 1-5 volts DC into 20, 000 ohms; 1-5 ma DC into 1000 ohms; 4-20 ma DC into 250 ohms; and 10-50 ma DC into 100 ohms. The totalized output shall be displayed on a direct reading seven-digit counter. The multiplier shall be in even multiples of ten; i.e. X 0.1, X 10, X 100. The unit shall be contained in a NEMA 1 plastic enclosure. The enclosure shall be mounted on a white lamiscoid faceplate over an aluminum backplate with separate removable top and bottom service and function identification strips engraved as indicated in the tabulation, all set in a black elastomeric raised bezel. Accuracy and range of totalization shall be 0.10% of full scale from 100% to 10% of full scale. The ambient temperature effect on accuracy shall be less than 0.01% of full scale per degree Farenheit. Line voltage variation of 105 to 125 volts AC shall have less than 0.15% effect on accuracy. The integrator shall be a BIF Model 257-25 or approved equal product.

Level Indicator - Receivers (LI-103,104,105): Each receiver shall be actuated by 4-20 ma-DC signals. The electronic circuitry shall be of solid state components. The electronic circuit shall include an I.C. (integrated circuit) amplifier which receives the dc input signals. Each amplified dc signal shall drive a servo positioner by means of a closed loop. The servo shall drive the various readout devices as indicated. All components within the receiver shall be of modular construction with each circuit card plugged into a mother board which shall be wired directly to an internal terminal strip with color coded wire. The circuit shall be equipped with zero and span adjustments. The necessary dc power supply shall be an integral part of the receiver. The entire mechanism shall be mounted on a slide tray with all components completely serviceable from the front of the instrument. Internal wiring shall include an on-off switch and fuse. The case shall be steel with molded plastic door bezel containing a clear plastic door and magnetic latch. The upper border of the window shall display the service legend and the lower border the function, both engraved on white lamicoid with black letters. The case shall be equipped with indirect flourescent illumination and a test cord for servicing the receiver while removed from its case shall be furnished for each set of five or less instruments. The instrument case shall be finished in tan, the bezel shall be black. Each positioner shall drive a 270° indicator pointer over a dial length of approximately 6". Dial graduations shall be silk screen processed to specific units indicated in the tabulation. The graduations shall be black and red on white background. The dial multiplier, where required, shall be in even multiples of ten only. The accuracy shall be + 0.5% of full scale over a 10:1 range.

Use two pen receivers to indicate pump bay level and river level on each indicator.

The indicator dial shall have uniform graduations with each function identified by legend and proper graduations as indicated in the tabulation. The necessary alarm switches, control contacts or retransmission potentiometers shall be furnished as indicated in the tabulation and driven by the servo positioner. The receiver shall be a BIF Model 257-14 (2I) or approved equal product.

Schedule: Provide instruments complying with the following:

FLOW METER

Unit Ident.	Size In.	Max. Flow.	Beta	Max. Headloss in W. C.	Operating Pressure
FE-101	30	24 M.G.D.	"B"	5	150 PSI

TRANSMITTERS (At Raw Water Station)

Unit Ident.	Measurement Range	Scale Type	Reading From	To	Output	Mtg.
FIT-101	24 MGD	Flow	0	24 MGD	4-20 MA	Wall
CDR-102	29 Ft.	Elev.	559	588	PSI	Panel
CDR-103,104,105	33 Ft.	Elev.	555	588	PSI	Panel
LIT-102	29 Ft.	Elev.	559	588	4-20 MA	Panel
LIT-103,104, 105	33 Ft.	Elev.	555	588	4-20 MA	Panel

RECIEVERS: (At Water Treatment Plant)

Unit Ident.	Input	Function	Measurement Range	Scale Type	Reading From	To	Mtg.
FIR-101	4-20 MA	I/R	24 MGD	Flow	0	24	Panel
FZ-101	-	T	0 to 9,999,999 Thousand Gal.	-	-	-	Panel
LIR-102	4-20 MA	I/R	29 Ft.	Elev.	559	588	Panel
LI-103	4-20 MA	I(A)	33 Ft.	Elev.	555	588	Panel
104,105	(2)	I(B)	29 Ft.	Elev.	559	588	

Air Compressor: Dual air compressors for the bubbler supply shall be installed in the raw water station control panel and shall be of the piggy-back type,with a 10-gallon air receiver.The air receiver shall be ASME code, and the system shall include: pressure switch mounted and wired, check valve, safety relief valve, pressure gage, manual drain valve and manual on/off valve. The units shall require 115 volt, 60 Hz. 1 phase and shall be rated @ 1.45 SCFM @ 70 psig. The units shall have 1/3 HP motors and shall have separate switches and automatic alternator.

Annunciator: The water treatment panel shall also be equipped with an alarm annunciator system providing 20 windows for indicating alarm function. Provide alarm horn and acknowledge/silence switch. Flash lights and sound horn on alarm condition and continue until acknowledged. Light panels until alarm condition is terminated. Provide the following alarms:

No.	Condition	Raw Water Station Alarm Contacts Location
1	Low water level #6	Telemetry Panel/Bubbler
2.	Low Water Level #7	" " "
3.	Low Water Level #8	" " "
4.	Pump under pressure #6	Ball Valve Control Panel
5.	" " " #7	" " " "
6.	" " " #8	" " " "

No.	Condition	Raw Water Station Alarm Contacts Location
7.	Screen Head Loss #6	Telemetry Panel/Bubbler
8.	" " " #7	" " "
9.	" " " #8	" " "
10.	Screen Spray Pressure #6	MCC
11.	" " " #7	MCC
12	" " " #8	MCC
13.	High Main Pressure	PE1-1 (Press. SW Manifold)
14.	Low Main Pressure	PE1-2 (Press. SW. Manifold)
15.	Power Failure	Telemetry Panel
16.	Signal Loss	" "
17.	Spare	
18.	"	
19.	"	
20.	"	

INTERCOM: A separate leased line shall be provided for voice communication. The voice communication link shall pass frequencies from 0 to a predetermined cutoff frequency above which FSK tone may be added if so desired. Additional tone channels shall be separated from the voice cutoff frequency by 15% of the cutoff frequency. The voice communication shall be through a low pass filter which shall be bidirectional, card mounted and programmable for either balanced or unbalanced 2 wire service. Output impedance shall match a 600 ohm communication link. Temperature range shall be -30°C. to +70°C and signal level shall be +10 dBm. The insertion loss shall be -3dB: DC to the cutoff frequency. The unit shall be as furnished by BIF ACCUTEL, a unit of General Signal Corporation.

Tone Eqipment:

1. Frequency Shift Keying Tone Telemetry Transmitters

Frequency multiplexed audio tone transmitters shall be furnished to convey status and telemetry data over the communication link. The audio tone transmitters shall incorporate a crystal controlled oscillator and counter for generation of 2 or 3 state frequency shift tones. The output band pass filter shall provide both telephone line isolation and rejection of harmonics to prevent other channel crosstalk. Transmitted signal output shall be front panel adjustable via a twenty turn potentiometer. Minimum adjustment range shall be + 5d Bm to -30dBm. Output impedance shall match a 600-900 ohm communication link, rising off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75° C temperature range. Front panel indicators for mark, space and carrier on frequency outputs shall indicate the status of any particular unit. The units shall operate off a + 24VDC power supply. Units shall be comparable to the ACCUTEL Model FST as manufactured by BIF ACCUTEL, a Unit of General Signal.

2. Frequency Shift Keying Tone Telemetry Receivers

Frequency multiplexed audio tone receivers shall be furnished to convey status and telemetry data over the communication link. The audio tone receivers shall utilize a superhetrodyne circuit in conjunction with a crystal controlled local oscillator for control of mark, space and center frequency detection. The input band pass filter shall provide communication line isolation. The active IF band pass filter shall provide high adjacent channel rejection. Input gain shall be front panel adjustable by a twenty turn potentiometer (-40d Bm). Minimum selectivity shall be 45 dB down at adjacent channel center. Input impedance shall match a 600-900 ohm communication link, rising off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75° C temperature range. The front panel shall include indicators for mark, space and signal loss. The units shall operate off a +24VDC power supply. Units shall be comparable to the ACCUTEL Model FSR as manufactured by BIF ACCUTEL, a Unit of General Signal.

3. Frequency Shift Tone with Analog Transmitter

Analog signals for control and telemetering shall be transmitted by FSK audio tone. The analog transmitter shall be integral to the tone transmitter to reduce space and eliminate excessive interconnections. The unit shall accept an industrial ratio analog variable and convert it to 8-bit binary digital format. The data shall then key the FSK tone section adding format coding to synchronize the message. Accuracy shall be greater than ± 0.4% of full scale. The transmitter shall be capable of being frequency multiplexed with more than twenty channels on one communication link. The audio tone portion shall utilize a crystal controlled oscillator and counter for generation of tone frequencies. The output band pass filter shall provide both telephone line isolation and rejection of harmonics to prevent other channel crosstalk. Transmitted signal output shall be front panel adjustable via a twenty turn potentiometer. Minimum adjustment range shall be + 5dBm to -30dBm. Output impedance shall match a 600-900 ohm communication link, rising off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75 C temperature range. Front panel indicators shall include mark, space and carrier frequency on as well as full scale and zero to assist in maintenance of equipment. Zero and span adjustments are to be made on the front panel. The analog sampling rate shall be .88 seconds for 100 Hz or .52 seconds for 170 Hz channel spacing. The units shall operate off a + 24VDC power supply. Units shall be comparable to the ACCUTEL Model AT as manufactured by BIF ACCUTEL, a Unit of General Signal.

4. Frequency Shift Tone with Analog Receiver

Analog signals for control and telemetering shall be received by FSK audio tone. The analog receiver shall be integral to the tone receiver to reduce space and eliminate excessive interconnections. The unit shall output an industrial ratio analog signal which has been coded in 8-bit binary format. Accuracy is to be greater than ± 0.4% of full scale. The receiver shall be capable of being frequency multiplexed with more than twenty channels on one communication link. The audio tone receiver shall utilize a superhetrodyne circuit in conjunction with a crystal controlled local oscillator for control of mark, space and center frequency detection. The input band pass filter shall provide communication line isolation. The active IF band pass filter shall provide high adjacent channel rejection. Input gain shall be front panel adjustable by a twenty turn potentiometer (-40cBm). Minimum selectivity shall be 45dB down at adjacent off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75° C temperature range. The Front panel shall include indicators for mark, space and signal loss. Zero and span adjustments are to be made on the front panel. Analog update shall be .88 seconds for 100 Hz or .52 seconds for 170 Hz channel spacing. The units shall operate off a +24VDC power supply. Units shall be comparable to the ACCUTEL Model AR as manufactured by BIF ACCUTEL, a unit of General Signal.

5. Frequency Shift Tone with 8 Status Transmitters

Each status transmitter shall transmit the state of up to 8 electronic or mechanical switch contact closures using FSK tone telemetry. The status transmitter shall be integral to the tone transmitter to reduce space and eliminate excessive interwiring.

The 8 inputs are to be formatted with parity coding and transmitted using double scan techniques. The transmitter shall be capable of being frequency multiplexed with more than twenty channels on one communication link. The audio tone portion shall utilize a crystal controlled oscillator and counter for gemeratopm pf tpme freqiemcoes/ The output band pass filter shall provide both telephone line isolation and counter for generation of tone frequencies. The output band pass filter shall provide both telephone line isolation and rejection of harmonics to prevent other channel crosstalk. Transmitted signal output shall be front panel adjustable via a twenty turn potentiometer. Minimum adjustment range shall be + 5dBm to -30dBm. Output impedance shall match a 600-900 ohm communication link, rising off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75° C temperature range. Front panel indicators shall include mark, sapce and carrier frequency on to assist in maintenance of equipment. Status sampling shall occur every .96 seconds for 100 Hz or .56 seconds for 170 Hz channel spacing. The units shall operate off a + 24VDC power supply. Units shall be comparable to the ACCUTEL Model 8ST as manufactured by BIF ACCUTEL, a unit of General Signal.

6. Frequency Shift Tone with 8 Status Receivers

Each status receiver shall receive and output up to 8 contact closures. The status receiver shall be integral to the tone receiver to reduce space and eliminate excessive interwiring. Security, shall be provided through double scan and odd parity checking before update. A scan fail output and LED indicator shall be provided to aid in system maintenance. The receiver shall be capable of being frequency multiplexed with more than twenty channels on one communication link. The audio tone receiver shall utilize a superhetrodyne circuit in conjunction with a crystal controlled local oscillator for control of mark, space and center frequency detection. The input band pass filter provides high adjacent channel rejection. Input gain shall be front panel adjustable by a twenty turn potentiometer (-40dBm). Minimum selectivity shall be 45dBm down at adjacent channel center. Input impedance shall match a 600-900 ohm communication link, rising off channel. Frequency stability shall not exceed ± 0.02% maximum drift over -25° C to + 75° C temperature range. The Front panel shall include indicators for mark, space and signal loss. The status shall be updated each .96 seconds for 100 Hz or .56 seconds for 170Hz channel spacing. The units shall operate off a + 24VDC power supply. Units shall be comparable to the ACCUTEL, a unit of General Signal.

7. Power Supply

The power supply shall provide + 24VDC regulated power from 105-130 VAC input. The unit shall be rack mounted along with the tone transmitter/receiver modules. The input shall be protected by a fuse mounted in a fuse holder on the front panel. Front panel test points shall provide for ease of testing and an LED shall indicate that output voltage is on. The power supply must be capable of providing + 24VDC to drive the tone units, relays, panel lights and annunciator system as required. Units shall be comparable to the ACCUTEL, a unit of General Signal.

8. Line Protection

At each site, provide line surge protectors to protect the telemetry and control equipment from spurious telephone line conditions. This unit shall be back panel mounted and is to be connected between the telephone line and the telemetry and control equipment. Transient voltages above 90V line to ground or 180V line to line will cause the gas discharge tubes to short to ground. If the peak lasts more than an instant, 1/4 amp fast blow fuses will open the line. Units shall be comparable to the ACCUTEL Model LPU as manufactured by BIF ACCUTEL, a unit of General Signal. Also, at each site, provide Broch 440 lightning arrestors.

Panels:

The Contractor shall furnish and install control panels as detailed in the plans and as outlined under this portion of the specifications. A single supplier shall be used to furnish the control panels in order to maintain uniformity in appearance, a consistency in fabrication techniques.

The control panels shall be fabricated to the dimensions outlined in the plans. Construction shall be of 11 gauge hot rolled and required rigidity to prevent pane deflection. Panels shall be completely flat ground smooth free from all weld splatter and fabrication blemishes. The sections shall be fabricated such that when bolted together the front shall form a smooth continuous surface. Gasketing shall also be provided for light, tight construction. Panel front projections shall be fabricated of Formica laminated to both sides of select 1/2" laminated wood. The projected surfaces shall be further reinforced with an 11-gauge steel template when high density instrumentation is required. An aluminum bezel shall form the perimeter of the projected surfaces. Panels shall be equipped with gasketed pan type doors, with hidden hinges and three point latch. An interior lighting fixture shall be provided for each four feet of panel section. Utility outlets shall also be provided on the interior of each four foot panel section.

The panel shall be degreased, and painted with one primer coat of chlorinated rubber and two coats of catalyzed polyurethane enamel in a color to be selected by the Engineers.

All instruments, display lamps, switches, etc., shall be mounted on the panel fronts with identifying engraved plastic nameplates, and wired to terminal blocks with identifying numbers as shown on panel fabrication drawings. All wiring shall be neatly bundled with wire ties and/or run in wireways, with all wiring identified by color coding or numbering. All external electrical connections shall be made to labeled terminal blocks located at the bottom of each panel section. A power distribution panel with adequate fixed breakers shall be provided branch circuit protection for isolated power requirements as shown on the panel electrical drawings. Wiring shall be type XHHW, flame retardant, cross linked polymer, 600 volts rating, sized per National Electric Code for load requirements.

Water Treatment Plant Panel: The Panel shall be 4'-0" deep x 4'-0" wide x approximately 7'-6" tall and provided with side access. The panel shall include the following items:

1) Flow Indicator Recorder

2) Flow Totalizer

3) River Level Indicator Recorder

4) 2 Pen-Bay/River Level Indicator (3 required)

5) Stop/Start P.B./Station for Screens (3 required)

6) Stop/Start P.B./Station for Screen Spray Pumps (3 required)

7) Stop/Start P.B./Station for Raw Water Pumps (3 required)

8) Stop/Run Ind. Lights (18 required)

9) 20 Point Annunciation

10) Lamp Test and Annunciator silence button

11) Voice intercom with raw water station. Include on/off switch and speak switch.

Raw Water Station Panel: The panel shall be approximately 2'-0" deep x 4'-0" wide x 7'-0" high, and provided with front access. Use all steel construction and house the following:

1) Air Compressor

2) Bubbler System - 4 constant differential relays (CDR-102, 103, 104, 105)

3) 4 Level transmitters (LIT - 102, 103, 104, 105)

4) 2 Universal Tone racks.

5) Required Tone channels and power supply

6) Voice intercom with water treatment plant. Include on-off switch and listen switch.

SPECIAL CONSTRUCTION:

Ball Valve Control Panels (BVC):

Provide ball valve control panels for each of three ball valves, incorporating the hydraulic control package and accumulator, as furnished by the ball valve manufacturer, and all electrical controls, relays, switches, indicator, and other devices as indicated on the Drawings.

Construct ball valve control panels which function to control both the ball valves and the raw water pumps. The control panel will be tied to the telemetry panel to provide remote start-stop and alarms. Local start-stop controls will be required. Protective circuity from telemetry panel will be connected. Arrange protective circuits to provide the following functions:

			Action		
No.	Alarm Condition	Alarm Source	Prevent Start	Normal Stop	Emerg. Stop
1.	Low water level in pump bay	Telem.	x	x	
2.	High head loss across Screens	Telem.	x	x	
3.	Ball valve not seated	Limit Sw.	x		
4.	Ball valve not 100% open	Limit Sw.		x	
5.	Low differential pressure across ball valve in set time	Press. Sw. & timer			Stop Motor
6.	Power Failure	Internal			x

Under normal operating conditions, use control system to start pumps on local or remote switch actuation, then begin ball valve opening once pump discharge pressure exceeds line pressure by set amount. Initiate normal stop on local or remote switch actuation or alarm condition by closing ball valve. Adjust momentary contact limit switch on ball valve to shut down pump motor when valve is 95% closed. Provide emergency closure on power failure only. Initially set normal opening and closing times at 150 seconds. Set emergency closure time as recommended by the raw water pump manufacturer to prevent exceeding specified reverse runaway speed, however, not less than 20 seconds.

Coordinate work with instrumentation and telemetry manufacturer, ball valve manufacturer, and other appropriate vendors and subcontractors. Provide additional relays, contacts, wiring, piping, and other work or devices necessary to assure proper control function.

Completely prepipe the control panels, requiring only external piping connections to ball valve and accumulator. Use rigid copper tubing for internal piping with connections for 1/2 inch minimum piping to the ball valves and accumulator. Arrange so that operating speed adjustments on solenoid valves are readily accessible.

Completely prewire the control panels, providing terminal strips for external wiring connections and conduit entrances. Provide for external connections to ball valve unit switches and differential pressure switch, motor starter, instrumentation contacts required. Coordinate work with ball valve, motor control center, and instrumentation manufacturers to insure proper interfacing and operation of system. Operate electrical devices on 115 volt, 60 cycle, 1 phase AC current. Incorporate the following push-to-test, oil tight indicator lights, with terminal blocks for parallel connections:

1. Pump on (red)
2. Pump ready (amber)
3. Pump off (green)
4. Ball valve open (red)
5. Ball valve closed (green)
6. High discharge pressure (blue)
7. Pump motor trip (blue)

Include a bronze Bourdon tube pressure gage with a 6 inch face, reading from 0 to 200 PSIG, measuring discharge pressure at the pump. Connect pressure sensing line to an externally adjustable pressure switch with calibrated dial with set point from 0 to 120 PSIG, to provide high pressure alarm.

House ball valve controls in minimum 12 gage fabricated steel Nema 12 enclosures with hinged door front and locking type latch. Provide internal bulkhead to isolate electrical devices from hydraulics to prevent damage or hazardous conditions in the event of a hydraulic leak. Locate hydraulics in lower portion of enclosure with drain piping as indicated on the Drawings. Use conduit for any wiring passing through hydraulic section.

Mount indicator lights on the door and pressure gages adjacent to the door with a transparent viewing port. Provide main disconnect within panel, readily accessible with door open. Use free-standing enclosures approximately 24" w x 18" d x 72" ht. for each ball valve. Thoroughly clean enclosures after fabrication and apply a high quality baked enamel finish inside and out in color(s) selected by the Engineer. Arrange exposed devices to provide an attractive and logical information display, with engraved plastic nameplates for each device. Neatly arrange interior wiring and piping, and provide coded wiring and piping diagrams inside each panel. Locate entrances for all conduit and piping at the bottom of the panel.

Securely mount accumulator adjacent to control panel, providing brackets for either wall, floor, or cabinet mounting as appropriate for the equipment furnished, and as acceptable to the Engineer:

Refer to the Drawings for dimensional requirements and/or general arrangement. Refer to Section 16A, Electrical, for additional electrical requirements.

Ball valve control panels may be furnished by either the ball valve manufacturer, the instrumentation manufacturer, or by Burford, Hall, and Smith.

GENERAL PRODUCTS:

Pressure Electric Switch, Type 1 (PE1):

Furnish externally set, adjustable, fixed differential, hermetically sealed, pressure activated mercury switch providing on-off circuit control, visible calibrated dial showing exact operating value for which control has been set, integral wiring block, brass bourdon tube power element, and suitable for indicated mounting arrangement. Select units whose performance is unaffected by working pressures up to 300 PSIG. Comply with the following requirements:

Unit Indent.	Enclosure	Adjustable Operating Range, PSI	Fixed Differential	Electrical Rating A At VAC	Switch Circuits
PE1-1	NEMA 1	10-200	12 oz.	10 @ 120	SPST
PE1-2	NEMA 1	10-200	12 oz.	10 @ 120	SPST

Provide switches which will maintain open or closed positions beyond set pressure if indicated below. Where manual reset feature is indicated, include integral push button reset maintained, it will be held until the manual reset is engaged.

Comply with the following functional requirements:

Ident.	Manual Reset	Contact Function On Pressure Change	Initial Set Pressure
PE1-1	NA	Close on rise	90 PSI
PE1-2	NA	Open on rise	40 PSI

Firms offering units complying with these requirements include the following:

Mercoid

Ashcroft Switch, Dresser Industries

Pressure Gages:

Furnish pressure, vacuum, or combination gages as indicated on the Drawings or described in the Specifications, glass window, non-reflecting white face dial, contrasting balanced pointer, and 1/4 inch male threaded pressure connection. Provide mounting type as indicated on accompanying Drawings.

Include needle valves, furnished by PGA manufacturer for gage connection to provide positive shutoff.

Include pressure snubber or vibration damper to eliminate gage fluctuations.

Furnish gages with accuracy within one percent of full scale in 3-1/2 inch minimum size unless otherwise noted. Provide pressure and vacuum range as indicated, or as required by the installation.

Firms offering products complying with these specifications include the following:

Crosby Valve and Gage Company

Marsh Instrument Company

Electrical Contacts;

Use "hard contacts" for all switching functions, rated as not less than 120 V, 60 Hz, 5A non-inductive load. Furnish two contacts, one active and one spare, for each contact shown or required. Provide relays and other devices which will withstand continuous energization and which are not damaged by normal fluctuations in current and voltage.

PART 3 - INSTALLATION

GENERAL:

Uncrate and unpack materials, and securely and properly install all materials by or under direct supervision of vendor's service technician.

Make installations in accordance with manufacturer's recommendations. Advise Engineer of any conflict between Contract Documents and recommendations of manufacturer, before commencing installation.

Effectively protect all control and instrumentation from damage and accelerated wear or deterioration during construction.

INSTRUMENTATION AND CONTROLS:

Thoroughly clean instrumentation, controls and related systems as necessary before attempting initial operation. Use special care to remove foreign matter from connecting piping.

Perform calibration and adjustment of all systems by vendor's service technician.

Place all systems in service, and monitor operation until proper and reliable functioning is fully demonstrated. Before leaving any system in service, comprehensively brief the Owner and Engineer regarding system operation.

Modify or replace systems or components which do not dependably function as intended.

HOUSINGS:

Clean interior and exterior of enclosures and panels immediately prior to final Project acceptance using materials and methods recommended by housing manufacturer.

Touch up any imperfections in prefinished surfaces in a manner such that finished surfaces are free of visible imperfections or irregulatities.

SECTION 13W1

PROCESS PIPING:

PART 1 - GENERAL:

This section applies to piping work in conjunction with treatment works and other building and site work. Work includes the following:

Furnishing and installing process piping, including drainage.
Furnishing and installing pipe hangers, support brackets, and other piping accessories required.
Connecting piping to equipment
Testing constructed work.

The extent of process piping work is shown on the Drawings, or, if not shown, includes all piping not included with other related work.

Related Work Specified Elsewhere:

Earthwork, Section 2B1
Drainage Structures and Accessories, Section 2T1
Process Equipment, Section 13W4
Pumping Equipment, Section 13W3
Painting, Section 9A
Piping and Plumbing, Section 15C

Submittals:

Submit manufacturer's data evidencing compliance with the specifications. Submit manufacturer's recommendations for installation where applicable or as requested by the Engineer. Include submittals on the following:

Pipe and Fittings
Pipe Hangers and Accessories
Valves and Operators
Process Piping Specialties

Valves and Operators:

Provide valves and operators of the type specified. Unless otherwise noted, size operators to actuate valves from open to close, providing adequate stem torque or force for tight shutoff and unseating valves regardless of frequency of operation. Size manual operators including handwheels, levers, gears, and other components, so that maximum required manual input does not exceed 80 pounds to wheels or levers or 150 ft pound to operating nuts.

PART 2 - PRODUCTS:

CAST IRON PIPING SYSTEMS:

Ductile Iron Piping System (DI):

Use ductile iron pipe complying with ANSI A21.51 with wall thickness not less than required by Table 51.1 for type 2 laying condition and 2.5 and 5 feet of cover and by Table 51.2 for 250 psi internal pressure. Use greater thickness where indicated on the Drawings or where required by the actual depth of installation in accordance with Table 51.3. Provide cement mortar lining and bituminous coating in accordance with ANSI A21.4. Use Class 250 cast or ductile iron fittings complying with ANSI A21.10 with same lining and coatings as pipe. Provide special fittings where specified or where required to connect to equipment or other pipe. Use Class 52 minimum for 30" piping.

Unless otherwise specified or required use the following joint type in the locations indicated:

Flanged Joints: Within structure or above grade installations. Use rubber gaskets complying with ANSI A21.10, Appendix A.

Mechanical Joint: Within 10 feet of structure of where pipe is to be installed in a casing or liner. Mechanical joints may be used in lieu of push-on-joint at Contractor's option. Use rubber gaskets complying with ANSI A21.11.

Push-on-Joint: Further than 10 feet from structure. Use rubber gaskets complying with ANSI A21.11.

Restrained Joints (RJ): Use push-on-joints with restraining lugs, or similar lugged joints if acceptable to the Engineer. Design joints to restrain minimum 250 psi working pressure without joint separation or distress. Use corrosion restraint alloy bolts and rubber gaskets complying with ANSI A21.11. Use restrained joints for all exterior piping unless otherwise noted.

Valves and Accessories:

Provide the following valves, operators, and accessories where indicated on the Drawings:

Gate Valves (GV): Use iron body bronze-mounted AWWA C500 gate valves with non-rising stem for buried service. Use either non-rising stem or indicator or OS&Y valves for above ground installation. Unless otherwise indicated, use OS&Y valves for above ground installation. Use end types as specified for connecting piping. Provide extension stem operating nut, and valve box for all valves in buried service, and handwheels for all non-buried valves unless otherwise indicated or required.

Butterfly Valves (BFV): Use rubber seated, iron body, AWWA C504 butterfly valves. Unless otherwise noted or required for connecting piping, use wafer style valves. Provide manual reducer, extension stem, operating nut, and valve box for all buried valves, and unless otherwise indicated or required, provide manual reducer and removable handwheel for all non-buried valves, and the following operators where indicated or required.

Type 3 (OPR-3): Manual reducer, chainwheel, chain guide and rust proof chain in length as required by the installation

Type 4 (OPR-4): Extension stem or shaft, CI stem guides, couplings, floor box and operating nut.

Type 5 (OPR-5): Extended bonnet, support brackets, geared reducer and indicator, and handwheel.

Type 6 (OPR-6): Extension stem or shaft, CI stem guides, CI floor stand, handwheel and indicator.

Check Valves, Spring and Lever (CV/SL): Use iron body, bronze mounted, horizontal swing-check valves with external spring and lever, complying with AWWA C500. Use flanged ends and provide means for spring tension adjustment.

Check Valves, Non-Slam (CV/NS: Use iron body, spring-loaded silent check valves with bronze seat and plug and stainless steel spring. Support shaft at center of both ends with bronze seats or bushings. Size spring to close valve before flow reversal occurs while restricting head loss to 2.5 ft. at 6 F.P.S. entrance velocity. Construct so seats and plugs are replaceable in the field, and utilize stainless steel retainers. Use valves suitable for 150 psi service in either wafer or flanged globe configuration as indicated on the Drawings.

Grooved Joint Couplings (GJC): Use two piece malleable iron couplings with resilient gasket and corrosion resistant bolts providing angular flexibility while restraining joint. Use Victaulic Style 31 or equal.

Flexible Couplings (FC): Use gasketed, sleeve type, bolted flexible couplings utilizing rubber compression gaskets compatible to the pipe furnished and providing a leak-free joint, with up to 4 degrees pipe deflection. Provide corrosion resistant materials throughout. Use Dresser Style 38 or equal.

Provide lugs on piping and restraining rods where indicated or required by installation.

Flap Valve (FV): Use cast iron, bronze mounted, swing type flap valves which swing open under direct pressure and close tightly when pressure is relieved or reverses. Provide flanged connecting pipe end unless otherwise indicated on Drawings.

Galvanized Steel Piping System (GS):

Use seamless or welded, hot dip galvanized steel pipe conforming with ASTM A120-63T, with threaded ends and couplings and galvanized steel or malleable iron fittings. Provide adapters as required to connect to other pipe fittings. Use schedule 40 minimum unless heavier wall is indicated on the Drawings.

Valves and Accessories: Provide the following valves, operators, and accessories where indicated on the Drawings:

Gate Valves: Use bronze, solid disc valves with threaded ends, non-rising stem, and handwheel, rated for 150 psi service.

Check Valves: Use bronze, swing check valves, with straightway construction and bolted cap, rated for 150 psi service.

Strainers: Use wye type strainer with resilient seals and open screen area at least twice pipe area.

COPPER AND BRASS PIPING SYSTEMS:

Copper Piping System (CU):

Use seamless copper tubing complying with ASTM B-88, Type K suitable for 200 psi working pressure at 200 deg. F.temperature. Use brass fittings, either compression, threaded, or soldered (wiped) as required by the installation. Use pipe and fittings suitable for 200 psi working pressure, furnished by one manufacturer.

Use soft annealed copper tubing for buried service and hard drawn copper tubing for all other service unless noted otherwise. Provide adapters as required.

Valves and Accessories:

Provide the following valves, operators, and accessories where indicated on the Drawings or required by the installation:

Corporation Stops (C/S): Use 200 psi brass corporation stops with tapered pipe threads, shut-off cock with straight or angled connections as required. Muller or equal.

Gate Valves (GV): Use bronze, solid disc valves with threaded ends, non-rising stem and handwheel operator, rated not less than 150 psi.

Check Valves (CV): Use bronze swing check valves with straightway construction and bolted cap, suitable for 150 psi.

Strainers (STR): Use bronze body with threaded ends, wye pattern strainers rated 150 psi.

STORM DRAIN PIPING:

Concrete Pipe (CP):

Use reinforced concrete pipe with bell and spigot joints complying with ASTM C443, Class IV, Wall B. Use rubber O-ring gasket and lengths not less than 8 feet unless otherwise required. Use concrete pipe for all storm drains (SD) unless otherwise noted.

PROCESS PIPING SPECIALTIES:

Pump Check Ball Valves (PCBV):

Furnish ball valve, valve controller and accessory assemblies as described or as required for the indicated functions. The entire assembly must be supplied by the ball valve manufacturer, and must be factory assembled, piped and satisfactorily tested before shipment.

Provide rubber or metal seated ball valves complying with AWWA C507, suitable for 150 PSIG service, and with tight shutoff in two directions. Use valves suitable for throttling service, and for both frequent operation and operation after long periods of inactivity; and which have full port openings and head loss not greater than an equal length of straight pipe of same nominal diameter. Utilize close-grained cast iron body with 125 pound flanges and one piece cast iron spherical rotor with port oriented 90 degrees to stainless steel shafts, and with permanently lubricated bearings having O-ring seals. Provide either rubber and stainless steel, or monel and stainless steel seats, on body and rotor. Use replaceable seats, which are adjustable for tightness. Factory test valves to 300 psi.

Actuate ball valves with totally enclosed, non-swivel type hydraulic cylinder operator complying with AWWA C507 and utilizing a cross-head and intermediate link. Use chrome plated stainless steel rod with wear compensating type seals. Fabricate other wetted cylinder parts of non-metallic materials suitable for intended service. Size valve cylinders to operate valve through all positions from fully open to fully closed with a cylinder operating presure of 50 PSIG or greater against a line differential of 150 PSIG.

Control cylinder operation with a solenoid type 4-way pilot valve for normal operation and two 2-way solenoid valves for emergency closure. Arrange system so that energization of the 4-way solenoid causes the ball valve to open over an adjustable 1 to 5 minute period, and deenergization causes the ball valve to close over an independently adjustable 1 to 5 minute period. Accomplish emergency closure by deenergization of 2-way solenoids thus bypassing the normal closing system, and allowing ball valve to close at a pre-set rate, adjustable from 10 to 60 seconds. Use heavy duty solenoids, amply constructed for long life, and suitable for 110V, 60 Hz operation. Initially set speeds as recommended by pump manufacturer and approved by the Engineer.

Include three rotary-stack type limit switches in a single NEMA 4 enclosure mounted on the ball valve cover. Arrange switches so that one switch makes and breaks separate contacts when valve is in fully open position and one switch makes and breaks separate contacts when valve is in fully closed position. Arrange third switch to momentarily make and break separate contacts during valve closing at a pre-set point adjustable between 50 and 95 percent of valve closure. Use switches whose contacts are rated not less than 5A at 120 VAC.

Provide manual operator on ball valve to allow its operation independently of control system.

For each ball valve, furnish a 3,000 PSI hydro-pneumatic accumulator system of sufficient size and capacity to operate the ball valve through two complete operating cycles based on an initial accumulator pressure no less than actual differential pressure across ball valve. Select accumulator having a nominal size of at least 10 gallons. Equip accumulator for water service including precharge bladder and stainless steel fittings, with provisions for recharging and repairing or replacing bladder. Incorporate an externally adjustable differential pressure switch to sense differential pressure across ball valve and to open and close separate contacts when set pressure is realized. Use switch with calibrated dial adjustable from 0 to 30 PSI higher pressure on pump side of valve. Use switch suitable for 300 PSI. working pressure, with connection for 1/2 inch conduit. Securely mount switch on ball valve.

Provide a complete, prepiped hydraulic control package for each ball valve consisting generally of solenoid valves, operating speed flow control valves, appropriate strainer, accumulator piping including check valve, isolation valves, pressure reducing valve and other accessories such that no external piping is required for proper ball valve control other than supply and waste connect ons to the package, and connections between package and hydraulic cylinder. Include capability of testing ball valve operation without electrical power.

Also provide an electrical package consisting of prewired solenoid valves to a single terminal strip. Coordinate electrical package so as to be complete when installed as an element in the ball valve control panels as specified in Section 13B.

Coordinate work with manufacturer of ball valve control panels.

Provide structural supports for ball valves as required and as generally indicated on the Drawings.

Firms offering products complying with these specifications include the following:

Bingham-Willamette Company

Henry Pratt Company

Sluice Gates (SLG):

Use heavy cast iron sluice gates with adjustable cast iron wedge blocks and corrosion resistant seating surfaces. Construct gates, frames, thimbles, slides, and cross bars of cast iron with a minimum thickness of 3/16 inch. Unless otherwise indicated, use flange back type frame and cast iron wall thimble. Provide flat back type frame and thimble where indicated. Where indicated on the Drawings, provide flush bottom opening with resilient seal which prohibits solids from accumulating at seating face. Secure wedge blocks to frame with at least two threaded fasteners per block. Use stainless steel for all threaded fasteners.

Operate gates with cast iron floor stands with either handwheel operator or enclosed gear reducer and side mounted handwheel or crank as indicated on the Drawings. Use stainless steel stems with guides as required, unless otherwise indicated. Use rising stem type operators with stem covers and indicators. Provide cast iron wall brackets where required by the installation. Furnish stainless steel anchor bolts for mounting operators, stem guides, and accessories.

Furnish and install sluice gates providing smooth operation and water-tight shutoff, and complying with the following:

Unit Ident.	Size In. V.& H.	Min. Head. Ft.		Seat Mat'l.	Geared Reducer
		Seating	Unseating		
SLG-1	36 x 48	55	10	Bronze	4:1
SLG-2	36 x 48	55	10	"	4:1
SLG-3	36 x 48	55	10	"	4:1
SLG-4	36 x 24	55	20	"	2:1
SLG-5	36 x 24	55	20	"	2:1

Provide bituminous or epoxy coating for all non-machined surfaces of sluice gates. Provide machinery enamel finish for operators. Refer to the Drawings for dimensional requirements and general arrangement.

Firms offering products generally complying with these specifications include the following:

Armco
Rodney Hunt
Waterman

Air Release Valves (ARV):

Use combination air and vacuum release valves which automatically bleed off trapped air regardless of pressure while preventing liquid from escaping, and allow air to enter valve upon vacuum conditions developing at the valve inlet. Construct valves with cast iron body and cover, stainless steel float, removable Buna-N seat, and bronze or stainless steel internals. Provide threaded connections at valve inlet and outlet, unless flanged connections are indicated on the Drawings. Use valves rated not less than 150 PSI working pressure and designed to close slowly to prevent surge and water hammer. Use separate air release valve with isolation provision for valves 3 inches or longer.

Provide non-slam surge-check valves for units 3 inches or larger. Provide isolation valve and spacers as required. Refer to the Drawings for dimensions requirements and general arrangement.

Use flanged connection for valves 4 inches and larger and threaded connection for smaller valves. Pipe exhaust vents as indicated on the Drawings, in size as recommended by valve manufacturer.

Firms offering products generally complying with these specifications include the following:

Valve and Primer Corp.
Val-Matic Corp.

Surge Anticipator Valve (SAV):

Use hydraulically operated, pilot controlled, diaphragm actuated valves in globe or angle configuration as indicated on the Drawings. Use valves designed to open rapidly on sensing high or low pressure waves, and to close slowly to relieve and eliminate surge pressures. Use valves which provide full pipe size open area and which close to tight shutoff under all operating conditions in the specified range.

Construct main valve of heavy cast iron with single replaceable seat, renewable, fully supported Buna-N diaphragm. Use brass, bronze, or stainless steel trim. Use packless construction and bolted top cover to allow servicing of valve without removal from line.

Construct pilot control system of brass and stainless steel. Use direct acting, spring loaded, adjustable diaphragm valves to adjust opening and closing speeds. Include wye type strainers and isolation valves in pilot lines. Provide brass remote sensing line as indicated on the Drawings with isolation valve or cock at connection. Include a hydraulic limiter to control amount of valve opening on low pressure pilot control.

Adjust pilots to open main valve at sensed high or low pressure above or below respective set points. Use valve capable of opening within 0.5 seconds of sensing a high pressure wave, or pressure above set point. Close valve slowly, gradually reducing flow without inducing noticeable surge. Initially set operating points and operating times as specified. Field adjust as required to eliminate surge.

Provide a position indicator for each valve.

Comply with the following requirements:

Unit Ident.	Size In.	End Type	Pressure Rating PSIG	Product	Capacity, GPM Cont.	Capacity, GPM Intermittent
SAV-1	12	Flg'd.	275	River Water	7000	16,000

Refer to the Drawings and other Contract Documents for dimensional requirements, general arrangement, and additional information, if any, necessary for proper valve sizing. Provide valves suitable for the following operating condition:

Unit Ident.	Set Pressure, PSIG Low	Set Pressure, PSIG High	Set Closure Time, Sec.
SAV-1	40	110	120

Firm offering products complying with these specifications include the following:

Cla-Val Company (Model 52-03)

Solenoid Control Valves (SCV):

Use hydraulically operated, pilot controlled, diaphragm actuated valves in either globe or angle configuration as indicated on the Drawings. Open to full pipe area and close drip tight at all operating conditions in the specified range. Construct valve body of heavy cast iron with brass or bronze trim with single removable seat and fully supported removable resilient disc. Provide bolted top cover so valve can be repaired without removing from line. Use packless construction and provide position indicator.

Control main valve opening and closing with a 3-way solenoid pilot with needle valves for adjusting opening and closing speed from 1 to 30 seconds. Provide wye type strainers for pilot lines and isolation valves on pilot system. Use brass pipe and fittings for pilot system.

Use valves suitable for operating pressures between 10 and 300 psi, at a maximum differential of 200 psi. Comply with the following:

Unit Ident.	Size In.	End Type	Capacity GPM	Main Valve Opening	Voltage VAC	Solenoid Enclosure NEMA
SCV-1	3"	Screwed	460	Energized	120	IV
SCV-2	3"	"	"	"	"	"
SCV-3	3"	"	"	"	"	"

Refer to the Drawings for dimensional requirements and general arrangement. Comply with provisions of Section 16A, Electrical.

Firms offering products complying with these specifications include the following:

Cla-val Company (Series 136-01)

Solenoid Valves (SV):

Use forged brass body with threaded pipe connections and stainless steel for components in contact with media, and Buna "N" seating. Use two-way valves suitable for air or water service in size indicated on the Drawings. Operate with differential pressure ranges specified.

Comply with the following requirements for the types indicated:

Type Ident.	Deenergized (Normal) Position	Differential Pressure Range Min. PSI	Differential Pressure Range Max. PSI	Pressure Rating, PSI
SV-1	Closed	0	100	300

Refer to the Drawings for number, size, and location. Provide explosion-proof, watertight solenoid enclosures when indicated on the Drawings or when installed in hazardous areas or areas subject to flooding. Provide manual operator for each solenoid valve.

Operate solenoid with 120 volt AC power, with watt rating not greater than 16. Provide NEMA 4 enclosure and connection for 1/2 inch conduit.

Provide connecting fittings or adapters required for installation. Mount valves with solenoid vertical when required by manufacturer.

Use solenoid valves manufactured by Automatic Switch Company, or equal.

Pressure Switches (PS):

Use externally adjustable, fixed deadband type pressure switches suitable for direct connection to pipe, and for wall mounting. Use vibration resistant switches with separate chambers for electrical, pressure, and adjustment. Use watertight enclosure with 3/4 inch conduit connections and 1/4 inch NPT pressure connection. Include contacts rated not less than 10A at 120 volts AC.

Provide pressure switches designed to operate at and above set point, complying with the following requirements for the type indicated:

Type Ident.	Contact Closure Operating Range Min.,PSI	Contact Closure Operating Range Max., PSI	Contact Function	Deadband PSI	Maximum Pressure PSI
PS-1	3	100	Open	5	200
PS-2	6	200	Close	10	200
PS-3	2	60	Open	1.5	150
PS-4	3	100	Open	5	200

Provide additional accessories and hardware required, including pressure connection and shutoff cock.

Refer to the Drawings for locations and set points.

Furnish switches manufactured by Automatic Switch Company or equal.

Wall Type Relief Valves (WRV):

Use 4 inch cast iron wall mounted hydrostatic relief valves with wall pipe and flanged connection. Provide integral strainer in inlet end. Provide iron body bronze mounted valves with resilient seat, with flap valve outlet designed to permit one way flow.

PROCESS PIPING ACCESSORIES:

Cellular Glass Insulation:

Cellular glass conforming to Federal Specification HH-I-551c and tested in accordance with ASTM C240-50T.

Use sectional moulded type, formed to fit the radius of curvature and securely banded in place. Fittings and valves shall be insulated with cellular glass fabricated fitting sections. Use 1-1/2 inch minimum thickness for piping smaller than 4 inches and 2 inch minimum thickness for other piping. Refer to Section 15B for jacket and installation requirements. Provide any accessories isolation wrap or other items required for the particular type of pipe used.

Meter Boxes (MB):

Use rectangular cast iron meter boxes and covers with dimensions approximately 20" x 13" x 12" deep. Provide traffic type boxes in paved areas.

PART 3 - INSTALLATION:

GENERAL:

Refer to Division 2 for pipe bedding and earthwork requirements. Provide concrete pads or stabilization stone bedding under valves and fittings in buried service.

Locate piping as indicated on the Drawings. Install pipe generally in straight line with multiple runs parallel unless otherwise indicated on the Drawings or required by the installation.

Install pipe and accessories in accordance with the manufacturer's recommendations as approved by the Engineer. Provide concrete thrust blocking and/or reaction bracing for buried piping as required by the installation to provide proper restraint while retaining accessibility to fittings and valves. Prevent dirt and debris from entering pipe and remove any foreign materials from pipe.

Comply with pipe manufacturer's instructions for installing and joining pipe. Use only joint lubricants, gaskets, bolts, and other realted materials that are furnished by the pipe manufacturer.

Perform all welding in accordance with AWS standards. Use nby welders qualified to perform any welding required, irrespective of pressure, position or class, in accordance with AWS standards. Submit satisfactory evidence as to the qualifications and certification by an acceptable testing authority for each welder employed.

Provide caulked type wall sleeves for all pipe, except clay or concrete, passing through walls. Use cast iron sleeves with intermediate collars for iron pipe 4-inches to 24-inches. For other piping, unless otherwise noted, use Schedule 40 steel pipe sleeve. Caulk pipe in sleeve to prevent leakage around pipe. Install clay and concrete pipe by either casting in concrete or providing formed opening and sealing around pipe with grout and mortar to prevent leakage around pipe.

Provide all pipe supports required for pipe installation. Use prefabricated hangers and brackets to support pipe without overstress, distress or visible deflections. Provide racks or continuous support as required by the installation. Use pipe restraints where required to resist thrust loads and prevent movement of pipe. Design pipe support system to protect piping and structure. Do not support pipe from overhead unless indicated on the Drawings or approved by the Engineer. Utilize supports which do not obstruct passageways or access to equipment. Modify structures, if required by the Engineer, to accommodate pipe support loads imposed. Support pipe within six-inches of floor with concrete pads. Provide additional supports, clamps, brackets, etc., as required to correct any noticeable deflection or movement of piping due to service conditions or hydrostatic testing.

Provide all acesssories and perform all work required to construct complete, functional piping installations.

Gravity Lines:

Lay gravity lines to accurate line and grade using straight runs between structures unless otherwise specifically noted on the Drawings. Remove and relay or replace pipe which deviates from line or grade or which has sags, kinks, or other detrimental features.

Test gravity lines by plugging lower end and filling with water to test for exfiltration, and/or installing weirs in lines to test for infiltration as directed by the Resident Engineer. Repair any visible leaks and perform repairs and retesting as required to demonstrate infiltration and exfiltration rates not greater than 500 GPD per inch diameter per mile. Repair any and all visible leaks.

Pressure Lines:

Install pressure lines generally as indicated on the Drawings Where bends are indicated, deflect pipe within manufacturer's recommended limits or use manufactured bends or fittings. Lay liquid pressure mains on a continuous rise in the direction of flow unless otherwise noted or required.

Test pressure lines by filling with water and maintaining pressure of 150 psi. or higher test pressure if required elsewhere in the contract documents for at least 6 hours and measuring make-up water. The volume of make-up water require is equivalent to the leakage and shall not exceed 1/2 gallon per day per inch diameter per 100 feet of pipe. Repair and retest as required. Disconnect equipment other than pumps until testing has been completed. Eliminate any and all visible leakage regardless of volume.

Test ductile iron raw water piping to 250 psi. Isolate or disconnect pumps, instruments, and other non-piping equipment not rated for test pressure, prior to testing.

SECTION 13W3

PUMPING EQUIPMENT:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

The extent of pumping equipment work is indicated on the Drawings. Work includes the following:

Furnishing and installing pumping units
Testing constructed work.

Realted Work Specified Elsewhere:

Process Piping, Section 13W1
Drainage Structures and Accessories, Section 2T1
Electrical, Section 16A

MANUFACTURER'S EXPERIENCE:

Furnish equipment produced by manufacturers regularly engaged in the production of the equipment specified. Provide suitable evidence that the manufacturers have engaged in the production of such equipment for at least five years and has produced pumping equipment similar to that specified, in both type and performance, which has been successfully operating for at least five years.

SERVICE:

The manufacturer of pumping equipment furnished shall have a factory trained, qualified service technician stationed in the immediate project area. The name, address, and telephone number of the service technician shall be included with submittals and operation and maintenance literature.

SUBMITTALS:

Submit manufacturer's data evidencing compliance with the specifications, including information on materials of construction, performance, dimensional drawings, special requirements, and other data. Include manufacturer's recommendations for installation, start-up, operation, and maintenance. Provide copies of warranty and service agreements. Include submittals on the following:

Pumps and drivers

Accessories

OPERATION AND MAINTENANCE MATERIAL:

After placing equipment in service and prior to final project completion, furnish six complete sets of unmarked operation and maintenance literature. Include approved as built drawings, wiring diagrams, parts lists, and suppliers, maintenance materials, and complete operation and maintenance instructions.

PART 2 - PRODUCTS

VERTICAL TURBINE PUMPS

Vertical Turbine Pumps, Type 1 (VTP1):

Use single or multi-stage, vertical turbine, pumps suitable for continuous or intermittent operation in raw or river water service. Furnish and install pumps complete including pump bowls, discharge column, discharge head, electric motor drive, and accessories. Comply with the following:

	Design Point				Max.	Min.
Unit Ident.	Q GPM	TDH Ft.	Min. Efficiency%	Max RPM	Shutoff Head. Ft.	TDH Ft.
VTP1-1	5550	168	85	900	270	100
VTP1-2	5550	168	85	900	270	100
VTP1-3	5550	168	85	900	270	100
VTP1-4	200	225	81	1800	315	135
VTP1-5	200	225	81	1800	315	135
VTP1-6	200	225	81	1800	315	135

In addition, comply with the following operating requirements for the indicated units:

Unit Ident.	Q GPM	TDH Ft.	Min. Efficiency,%
VTP1-1	6400	140	84
VTP1-2	6400	140	84
VTP1-3	6400	140	84

Note: Flow at secondary operating point may vary plus or minus 100 GPM from that specified.

Select pumps which operate at high efficiency at any operating condition between design point and the secondary operating point, such that the minimum efficiency within this range is equal to the lower of the two operating point efficiencies specified. Use pumps which will operate smoothly, without cavitation, hydraulic instability, or noticeable vibration in the installation indicated and with the submergence available at low water cutoff.

Refer to the Drawings for dimensional requirements and general arrangement.

Construct pumps and motors to allow reverse rotation at up to a minimum of 125 percent of design speed without damage or excessive wear. Recommend maximum ball valve closure time on power failure to units 1, 2 and 3 to prevent exceeding this limit. Furnish pump and motor units which will not reach such speeds with closure time set at 20 seconds. Coordinate with ball valve control panel manufacturer.

Use epoxy or enamel lined, cast iron or meehanite bowl stage sections with suction bell at inlet. Provide inlet strainer where indicated on the Drawings or where required by the pump manufacturer to protect the pumps. Use enclosed or semi-enclosed bronze impellers, each secured to a heavy duty stainless steel shaft with locking bushings or retainers and with provisions for clearance adjustment between impellers and bowls without removing pumps. Provide replacable bronze wear rings on pump bowls or impellers. Support shaft at each end with bronze and/or neoprene, product lubricated bearings. Statically and dynamically balance the entire rotating assembly. Pumps VTP1-1, 2, and 3 shall have hydraulically balanced impellers.

Construct discharge column of carbon steel pipe with interchangeable flanged sections not exceeding 8 feet in length. Run heavy duty open stainless steel lineshaft with machined threaded or keyed couplings, at same spacing as column, through centering spiders, each with a bronze or cutless rubber bearing. Design shafting and couplings to permit reverse rotation without loosening couplings. Accurately and rigidly maintain correct shaft location. Machine and butt shaft ends to insure accurate alignment at joints. Design all column flanges to support weight of entire column and pump assembly for removal and installation. Utilize product lubrication for all pump bearings.

Construct discharge head from fabricated steel or heavy A48 cast iron with flanged above floor discharge connection to match connecting pipe. Use three-piece elbow for steel heads. Due to space limitations, a fabricated steel discharge heads may be plain end with provisions for flexible coupling and air release valve specified, provided that the proposed arrangement is acceptable to the Engineer. Utilize two-piece top shaft to facilitate disassembly, and provide access to openings in head. Provide a pressure relief valve in each pump casing, approximately sized to protect the pump. Utilize cast iron packing box construction with commercial packing and cast iron adjustable gland to prevent leakage at shaft entrance. Use replacable stainless steel wear sleeve to protect shaft through packing box area. Include water slinger above packing box. Support pump-driver assembly by the discharge head, utilizing a rugged foundation plate designed to transmit all pump loads without additional bracing or support. Provide stainless steel anchor bolts for installing pumps.

Construct pumps conforming with the following requirements:

Unit Ident.	Discharge Inches	Min. Column Inches	Min. Casing Working Pressure, PSI	Max.Dry Section Wt. Lbs.	Max.Dry Total Wt. Lbs.
VTP1-1	20	20	230	4,900	13,000
VTP1-2	20	20	230	4,900	13,000
VTP1-3	20	20	230	4,900	13,000
VTP1-4	4	6	300	NA	1,200
VTP1-5	4	6	300	NA	1,200
VTP1-6	4	6	300	NA	1,200

Drive pumps with vertical hollow shaft, Code F (inrush) squirrel cage induction motors. Use weatherproof (WP-1) enclosure and conform to NEMA design B characteristics. Use heavy duty grease or oil lubricated ball or roller-type bearings. Carry all mechanical and hydraulic thrust loads developed with the motor thrust bearing. Include shaft coupling between motor and pump. Furnish motors of sufficient torque and horsepower to allow starting under load and so that nameplate horsepower rating will not be exceeded at any pump operating condition from shutoff to minimum specified head. Provide lifting lugs on motors. Arrange so motor can be lifted off and away from pump with lifting devices indicated on the Drawings.

Comply with the following electrical requirements:

Unit	Max	Service	Electrical Characteristics		
Ident.	H.P.	Factor	Volts	Phase	Hz
VTP1-1	300	1.15	480	3	60
VTP1-2	300	1.15	480	3	60
VTP1-3	300	1.15	480	3	60
VTP1-4	15	1.15	480	3	60
VTP1-5	15	1.15	480	3	60
VTP1-6	15	1.15	480	3	60

Refer to the related specifications for additional electrical requirements. Construct pump motor units to permit installation and removal with the hoisting equipment specified. Conduct certified pump tests in accordance with Hydraulic Institute Standards to insure compliance with the specifications. Perform certified tests of the following pumps:

VTP1-1, 2, or 3 (one test required)

The Owner and/or Engineer will have the option of witnessing pump tests. Expenses for witnessing retests of failing pump tests will be paid by the contractor. Provide vertical turbine pumps produced by one manufacturer.

Firms offering products generally complying with these specifications include the following:

Byron Jackson
Fairbanks-Morse

Eductors (ED):

Use cast iron, bronze fitted eductors suitable for pumping sand, mud, and other grit materials using a raw water supply as a motive fluid. Use bronze pressure nozzle and agitation jets which are readily replaceable. Provide threaded connections for motive fluid and discharge piping.

Comply with the following requirements:

Unit Ident.	Discharge Size, In.	Supply Size, In.	Discharge Head, Ft.	Max. Supply PSI.	Max. Supply GPM	Educted Fluid, GPM
ED-1	3	2-1/2	32	60	85	38
ED-2	3	2-1/2	32	60	85	38
ED-3	3	2-1/2	32	60	85	38

Refer to the Drawings for dimensional requirements and general arrangement.

Firms offering products complying with these specifications include the following:

Ametek, Schutte and Koerting Div.

PART 3 - INSTALLATION

Construct pads and foundations as shown on the Drawings or, if not shown, in accordance with the manufacturer's recommendations. Install anchor bolts and other embedded items as required.

Comply with the equipment manufacturer's instructions for installing pumping equipment.

Unless otherwise required, set pumping equipment in the correct position, obtaining proper alignment as indicated on the Drawings, and pack under base with non-shrink grout.

Install all connecting piping, wiring, and controls.

Place all protective devices in proper operating condition prior to placing equipment in service. Have installation checked by manufacturer or his representative prior to placing unit in service.

Make all necessary adjustments to insure proper and efficient operation.

Replace any component, device, or unit which fails to demonstrate satisfactory performance.

SECTION 13W4

PROCESS EQUIPMENT:

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

This section applies to process equipment for water works service and treatment. Work includes the following:

Furnishing and installing process equipment.

Related Work Specified Elsewhere:

Painting, Section 9A
Process Piping, Section 13W1
Electrical, Section 16A

Manufacturer's Experience:

Furnish equipment produced by manufacturers regularly engaged in the production of the equipment specified. Provide suitable evidence that the manufacturers have engaged in the production of such equipment for at least five years and has produced process equipment similar to that specified, in both type and performance, which has been successfully operating for at least five years.

Service:

The manufacturer of process equipment furnished shall have a factory trained, qualified service technician stationed in the immediate project area. The name, address, and telephone number of the service technician shall be included with submittals and operation and maintenance literature.

Submittals:

Submit manufacturer's data evidencing compliance with the specifications, including information on materials of contruction, performance, dimensional drawings special requirements, and other data. Include manufacturer's recommendations for installation, start-up, operation and maintenance. Provide copies of warranty and service agreements. Include submittals on the following:

Traveling Water Screens

Start-Up Assistance:

Provide a minimum of one day of assistance by a factory trained manufacturer's representative or serviceman for the process equipment furnished. Obtain two copies of signed certificates or letters from the factory authorized representatives indicating that the equipment has been installed in accordance with the manufacturer's instructions and recommendations. Do not operate equipment until installation is certified. Test units, and/or place in service in the presence of the factory representative. Make adjustments to equipment as required for proper operation. Have the factory representative instruct the Owner's personnel in the proper operation and maintenance of the manufacturer's equipment.

Operating and Maintenance Material:

After placing equipment in service and prior to final project completion, furnish six complete sets of unmarked operation and maintenance literature. Include approved as-built drawings, wiring diagrams, parts lists and suppliers, maintenance materials, and complete operation and maintenance instructions.

PART 2 - PRODUCTS

Traveling Water Screens (TWS):

Use flow-through type, chain driven, traveling water screens, suitable for vertical installation in a rectangular channel. Screen material from river water, and carry screenings to a waste flume at the operating floor. Use screens suitable for continuous and intermittent operation, with a chain speed of approximately 10 to 12 feet per minute. Include screen units complete, including removable screen baskets, chains, framework, backwash spray, drive unit, housing, and other related work.

Comply with the following requirements:

Unit Ident.	Min. Flow Depth,Ft.	Min. Q MGD	Basket Width	Channel Depth,Ft.	Backwash Q. GPM @	Spray PSIG
TWS-1	4.4	16	4'-6"	33	120	80
TWS-2	4.4	16	4'-6"	33	120	80
TWS-3	4.4	16	4'-6"	33	120	80

Refer to the Drawings for dimensional requirements and general arrangement.

Construct screen in replaceable basket units. Fabricate rigid basket frames from carbon steel with a minimum thickness of 1/4 inch, designed to retain debris and convey vertically and discharge to waste. Detail baskets to seal at sides, bottom, and joints, providing a maximum clearance of 1/16 inch. Provide minimum 3/16 inch thick seal plates as required. Use 3/8 inch stainless steel screen with not less than 0.105 inch diameter wire, with an open area not less than 60 percent of total. Attach screen to baskets with clamping bars and bolts which keep screen tight and flat, and cover any rough surfaces which would accumulate debris.

Secure baskets to hardened steel roller chains with replaceable links. Use 24 inch pitch with offset 3/8 inch sidebars, 1-1/4 inch pins with lubrication fittings, 3-3/4 inch minimum diameter rollers, and tubular pin bushings. Form closed loop of chain and screen to provide continuous screening.

Support and drive chain with heavy duty cast iron or fabricated steel sprockets with replaceable hardened steel teeth on the drive sprocket. Use rigid steel shaft supported with long life bronze bushings in heavy cast bearing housings. Provide ready access to bearing housings and provide take-up mechanism to adjust headshaft position and chain tension. Use maintenance-free driven shaft bearings suitable for submerged service.

Support mechanism with a sturdy fabricated steel frame, complete with supports for head and foot assembly. Use bracing as required to maintain frame in a rigid position. Allow only minimum clearance required between screen and frame to prevent bypassing of debris. Design frame so entire assembly can be installed and removed from overhead. Locate frame with heavy cast iron guides, designed to be cast in concrete. Provide chain guides to insure smooth operation of mechanism. Use support frame and mechanism adequate to support a differential level, or head loss, of up to five feet, at any water level from operating floor to channel bottom, without damaging the unit. Construct frame in sections to facilitate installation and removal. Provide lifting legs on head section and suitable lifting provisions on other sections.

Drive screen with an electric motor and gear reducer sized to start screen at up to 5 feet of head loss, and continuously operate, without overload, at up to 2.5 feed of headloss at any operating level. Use TEFC motor and helical gear Speed Reducer equipped with anti-friction bearings. Utilize full rated stalling torque of motor without damaging unit. Prevent any overstress of screen unit by using fluid couplings and/or shear pins on motor side of drive sprocket. Comply with the following electrical requirements:

Unit Ident.	Motor H.P.	Service Factor	Electrical Characteristics Volts	Phase	Hz.
TWS-1	1.5	1.15	480	3	60
TWS-2	1.5	1.15	480	3	60
TWS-3	1.5	1.15	480	3	60

Transmit load from drive unit to head shaft sprocket with a heavy duty steel roller chain using heat treated stainless steel bushings and heat-treated, chrome plated, stainless steel pins. Provide lubrication system for chain as required by the manufacturer for long life. Provide adjustable tensioner. Design units so drive chain is retained in upper housing in the event of chain failure.

Construct a backwash spray system to clean the screens and discharge spray water and debris to a waste channel, when supplied with river water at the capacity and pressure indicated. Use common steel headers with replaceable hardened stainless steel non-clog spray nozzles. Provide clean-outs at ends of header. Provide three inch minimum wye type strainer for each screen. Size strainer media to protect spray system and provide one spare media replacement for each screen. Provide a minimum three inch connection to the spray system.

House headshaft, drive, chain, spray, and other above floor components in a fiberglass enclosure of splash-proof construction. Mount motor and gear reducer on sturdy frame above housing. Include a quick opening inspection door of proper size and location to permit routine maintenance and inspection without removing housing. Utilize two piece housing construction to facilitate installation and removal, and arrange so that backwashed screenings are discharged to the waste channel as indicated on the Drawings. Construct housings of 3/16 inch minimum thickness of molded, laminated fiberglass. Use stainless steel hardware and fasteners throughout, including all anchorage. Provide resin rich gel-coat finish in green, or other color acceptable to the Engineer, and free from ripples, waves, rough spots, or other detrimental features. Provide lugs for removing housing.

Factory clean all non-machined ferrous metal surfaces, with the exception of chain, screen, and drive unit, in accordance with S.S.P.C. - SP. 6 as a minimum surface preparation. Apply a minimum of two coats of 5 mil dry thickness coal tar epoxy. Finish drive units with machinery enamel coating to match housing color. Furnish rust-free chains which have received a shop coat of slush oil.

Firms offering products generally complying with these specifications include the following:

FMC
Rex

PART 3 - INSTALLATION

Construct pads and foundations as shown on the Drawings, or, if not shown, in accordance with the manufacturer's recommendations. Install anchor bolts and other embedded items as required.

Comply with the equipment manufacturer's instruction for installing process equipment.

Unless otherwise required, set process equipment in correct position and pack under base with non-shrink grout.

Install all connecting piping, wiring, and controls.

Paint equipment in accordance with manufacturer's recommendations for finish coat. Touch up damaged primed surfaces and apply high quality machinery enamel finish.

Place all protective devices in proper operating condition prior to placing equipment in service. Have installation checked by manufacturer or his representative prior to placing unit in service.

Make all necessary adjustments to insure proper and efficient operation.

Replace any component, device, or unit which fails to demonstrate satisfactory performace.

SECTION 14A

CRANES AND HOISTS:

PART 1 - GENERAL

Related Documents:

The general provisions of the Contract, including General and Supplemental Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

The extent of cranes and hoists work is as shown on the Drawings, and as herein specified. Work includes the following:

Furnishing and installing bridge cranes
Furnishing and installing fixed monorails
Furnishing and installing trolleys and hoists
Furnishing and installing electrification systems
Furnishing dolly

Related Work Sepcified Elsewhere:

Structural Steel,	Section 5A
Painting,	Section 9A
Electrical	Section 16A

REFERENCE SPECIFICATIONS:

Crane Manufacturers' Association of America
(1974)
Hoist Manufacturers' Institute

MANUFACTURERS:

Furnish equipment produced by manufacturers regularly engaged in the production of the equipment specified. Provide suitable evidence that the manufacturers ahve engaged in the production of such equipment for at least five years and has produced equipment similar to that specified, in both type and performance, which has been successfully in service for at least five years. In order to limit the number of manufacturers, furnish all equipment under this section from one manufacturer or manufacturer's representative.

SERVICE:

The manufacturers of crane and hoist equipment furnished shall have a factory-trained, qualified service technician stationed in the immediate project area. The name, address, and telephone number of the service technician shall be included with submittals and operation and maintenance literature.

SUBMITTALS:

Submit manufacturer's data evidencing compliance with the specifications, including information on materials of construction, performance, dimensional drawings, design calculations, special requirements, and other data. Include manufacturer's recommendations for installation, start-up, operation, and maintenance. Provide copies of warranty and service agreements. Include submittals on the following:

Bridge Crane and Hoist
Monorail and Trolley
Dolly

OPERATION AND MAINTENANCE MATERIAL:

After placing equipment in service and prior to final project completion, furnish six complete sets of unmarked operation and maintenance literature. Include approved as-built drawings, wiring diagrams, parts lists, and suppliers, maintenance materials, and complete operation and maintenance instructions.

PART 2 - PRODUCTS

BRIDGE CRANE:

Furnish and install a single girder underhung traveling bridge crane and motorized hoist. Design and construct unit of structural steel in accordance with the standards of the Crane Manufacturers Association of America for infrequent use application but with precise handling. Refer to the Drawings for required span, travel, suspension method, and general arrangement.

Construct unit with rated nominal 10-ton capacity. Furnish and install bridge, hoist, electrification system, and runways as approved by the Engineer. Provide hook approach within 3 ft.-8 inches on north and south walls and within 27 inches and 36 inches on the West and East walls respectively. Use hand geared bridge drive with corrosion resistant chain. Use bridge crane-hoist combination which provides lift to within 6 ft.-6 inches from bottom of support beams. Use braced end trucks which allow specified travel with maximum runway ECL of 36,000 lbs. Provide motorized bridge drive if required to meet approach requirements. Provide electrification system on runway and girder to power hoist and other motor drives, if any.

Use either UL approved insulated bars or festooned UL approved insulated power cable designed to permit full travel and continuous energization of drive motors without breaking contact or hunting. Refer to the Drawings for location of power connection to bridge crane unit. Provide all necessary conductor and components beyond. Arrange so system does not interfere with hoist, bridge, runways, or structure. Provide bridge mounted electrical panel housing starters and overload protection for all drive motors. Use high torque motors with sealed bearings, thermal overloads, and 55° C rise with Class B insulation, for use with 460 volt, 3 phase power.

Use 10 ton motorized wire rope hoist with hand geared trolley suspension, complying with the standards of the Hoist Manufacturers Institute. Construct unit of heavy duty steel frame in low headroom, compact configuration. Provide fully scoured drum for specified lift without overwind, and helical and spur gear reduction with all gears operating in a sealed oil reservoir. Use ball bearings for all gear and drum shafts. Use totally enclosed motors with weight actuated upper limit switches, low voltage magnetic controls, and magnetic disc type motor brake. Use mechanical Weston-type automatic load brake with external adjustment. Provide 25 feet of lift at approximately 10 FPM. Factory test hoist to 125 percent of capacity.

Use corrosion resistant coil link chain with sheave and guard for hoist drive. Extend chain to within 4 feet of floor and provide gearing so maximum chain pull does not exceed 50 pounds. A motor driven trolley may be used in lieu of hand geared if required to meet dimensional requirements.

Power unit with a maximum total of 9H.P. Use push button pendant controller supported from hoist with a chain or steel cable.

After fabrication, clean bridge crane unit in accordance with SSPC-No. 6 and shop apply prime coat. Mechanically clean and touch up after installation. Apply finish coat of gloss machinery enamel of paint manufacturers best grade in color acceptable to the Engineer. Hoist need not be painted if satisfactory factory finish is undamaged.

Firms offering products complying with these specifications include the following:

Philadelphia Tramrail Company
Robbins and Myers Hoists and Cranes

MONORAIL AND TROLLEY:

Construct a 4-ton fixed monorail as indicated on the Drawings. Comply with the provisions of the reference specifications. Include a 4-ton hand geared beam trolley to run on the monorail. Use corrosion resistant coil type hand chain with sheave and guard and chain drop to within 4 feet of ground. Use sealed ball bearing wheels and drive and heavy duty steel construction. Provide machinery enamel finish.

DOLLY:

Construct a 4-ton Dolly using heavy steel frame and hardwood deck approximately 4 ft. x 4 ft. Use rubber tired ball bearing caster wheels not less than 4 inch diameter and locking provisions. Arrange so deck is not more than 18 inches above rolling surface. Provide corrosion resistant coating for all steel and varnish finish on hardwood

PART # - INSTALLATION

Where units travel on rails, install rail stop devices to limit safe travel distance.

Follow manufacturer's installation recommendations. Make adjustments to obtain proper oepration.

Do not leave units operable until an inspection by the Contractor has determined them to be safe for full rated load by load testing.

Protect units from damage during contruction, clean thoroughly upon completion of project.

SECTION 15A

HEATING AND VENTILATING SYSTEMS

01 GENERAL:

a. GENERAL CONDITIONS and SPECIAL CONDITIONS shall govern all work under this Section.

02 SCOPE:

a. This Section of these Specifications and the accompanying Drawings are intended to describe and provide for the furnishing, installing and placing in successful operations and/or service all heating and ventilating systems for Middle Oconee Raw Water Station, Athens. The above systems shall be complete with all miscellaneous services. Items shall be provided as indicated on the accompanying Drawings and as described and/or specified herein.

03 BASES OF DESIGN AND OPERATION:

a. The following are the design bases for the Ventilating and Heating Systems.

b. Outside design conditions at or between 92 degrees Fahr. dry bulb and 22 degrees Fahr. dry bulb. The heating system is designed to maintain 65 degrees Fahr..

04 INSTALLATION REQUIREMENTS:

a. All equipment and materials required by these Specifications and/or indicated on the Drawings shall be furnished, except where otherwise specifically noted, completely installed, aligned, grouted, adjusted, tested, and left in a safe and satisfactory operating condition. All equipment, accessories, appliances, and connections, except electrical power connections, necessary for the successful operation of the equipment shall be furnished and installed as a part of the work. The electrical power connections will be provided under Section 16 of these Specifications.

05 SPACE REQUIREMENTS:

a. All apparatus, equipment, etc., shall fit into the space provided in the buildings, or within the property, and shall be installed at such time and in such manner as to avoid damage to the building structure or property, and as required by the job progress. Equipment, apparatus, and accessories requiring normal servicing or maintenance shall be made easily accessible.

06 COOPERATION WITH OTHER TRADES:

a. This Contractor shall cooperate and coordinate with the Owner and other trades in the scheduling of work, moving of material, delivery and location of anchor bolts, sleeves, motors, and starters, etc.

07 SHOP DRAWINGS AND EQUIPMENT LISTS:

a. The Contractor shall, before incorporating materials and equipment in the work, submit lists of the products proposed for use in the installation. Lists shall be accompanied by bulletins, plates, drawings and schedules which shall indicate the relative characteristics and ratings with capacities of the respective items of equipment to meet the requirements of the Contract Documents. When standard equipment is modified to suit the conditions required by the Contract Documents, the lists shall be supplemented with certification from the manufacturers indicating the operating conditions, rating and capacity of the equipment proposed.

b. The Contractor shall also submit detail drawings that are shop drawings for installation of items such as exhaust fans and shop drawings from instrumentation and control manufacturers and sub-contractors on instrumentation and control systems including panels, piping and interlock wiring. The requirements for roof, and wall openings, motors and motor controllers, wiring diagrams, etc., for equipment furnished under this Section shall be coordinated with other Sections of these Specifications.

c. Shop Drawings and Equipment Lists of all trades shall be submitted only by the Contractor who shall indicate by a signed and dated stamp on the Shop Drawings and Equipment Lists that he has checked same, that the work shown on them is in accordance with Contract Documents, and has been checked for dimensions and relationship with work of all other trades involved. Shop Drawings and Equipment Lists shall be checked for accuracy and coordinated with other work, and corrected if necessary before submission to the Engineer. Under no conditions are shop drawings to be submitted to the Engineer by any other than the Contractor. If any drawings are submitted for approval that have not been checked and signed by the Contractor, they will be returned to the Contractor for checking, before they are reviewed by the Engineer.

d. The Contractor shall review, stamp with his approval and submit with reasonable promptness and in orderly sequence all Shop Drawings and Equipment Lists of materials and equipment to meet the requirements of the Contract Documents so as to cause no delay in his work or the work of the Owner or of any other Contractor. If Shop Drawings and Equipment Lists are not received with reasonable promptness, the Contractor shall expedite the Shop Drawings and Equipment Lists by telephone or visits to vendors' facilities at no additional cost to the Owner. If Shop Drawings and Equipment Lists returned for correction to comply with the Contract Documents are not corrected and resubmitted with reasonable promptness and thereby cause delay in the work, the Engineer may, with approval of the Owner and at no additional cost to the Owner, direct the Contractor to cancel such orders and place orders for material and equipment with vendors whose Shop Drawings and Equipment Lists can be submitted with reasonable promptness and accuracy and whose subsequent delivery of material and equipment will not further delay the progress of the work.

e. All Shop Drawings and Equipment Lists shall be submitted in accordance with the following:

(1) Shall have a label or title which indicates the Manufacturer's name and address, the Contractor's name and address, the Owner's name and address and the Engineer's name and Job Number.
(2) Shall have a label or title which clearly defines the item or items submitted, a suitable reference to the particular Contract Drawing Number or Specification article in which the item or items are specified.

f. At the time of submission the Contractor shall inform the Engineer in writing of any deviation in the Shop Drawings and Equipment Lists from the requirements of the Contract Documents.

g. The Engineer's approval of Shop Drawings and Equipment Lists shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written approval of the specific deviation; nor shall the Engineer's approval relieve the Contractor from responsibility for errors or omissions in the Shop Drawings and Equipment Lists.

h. When the Contractor does call such deviations to the attention of the Engineer, he shall state in his letter whether or not such deviations involve any change in contract price. If this is not mentioned, it will be assumed that no change in contract price is involved because of the deviations. Letters regarding the work shall be submitted to the Engineer only through the Contractor.

i. In the event a deviation from the Drawings or the Specifications is permitted and the deviation results in additional cost to the Owner, or another Contractor or other "trades" due to the acceptance of the deviation, the Contractor shall bear all cost and responsibility arising therefrom.

j. If the Contractor deviates from the Drawings or the Specifications and the deviation has not be approved, all such non-conforming work shall be corrected to comply with the Contract Documents without cost to the Owner.

k. The Contractor shall submit four (4) copies of the Shop Drawings and Equipment Lists to the Engineer for appropriate action and distribution. One (1) executed copy will be returned to the Contractor. The Contractor shall submit additional copies in such number as is required by his suppliers, field forces and sub-contractors.

l. The Contractor shall resubmit the required number of Shop Drawings and Equipment Lists, making any corrections required by the Engineer, until returned marked "APPROVED". No portion of the work requiring submission of Shop Drawings and Equipment Lists shall be commenced until the submission has been "APPROVED" or "APPROVED AS NOTED" by the Engineer. Shop Drawings and Equipment Lists returned to the Contractor provide authority to proceed in accordance with the following designations:

(1) "APPROVED" gives authority to proceed with the work as shown, subject to the requirements of the Contract Documents.
(2) "APPROVED AS NOTED" gives authority to proceed in accordance with the notes.
(3) "RETURNED FOR CORRECTION" does not give authority to proceed with any portion of the work shown thereon.

(4) "NOT APPROVED" means that the submission for equipment, fabrication or installation does not comply with the Contract Documents. Shop Drawings and Equipment Lists shall be submitted for equipment, fabrication or installation which comply with the Contract Documents.

08 CHOICE OF MATERIALS:

a. Certain manufacturer's product names, figure numbers, etc., are used in these Specifications to establish the qualities of materials, workmanship, and performance required. In such cases, the item mentioned is a product known to the Engineers which offers the design, materials, workmanship, and performance required.

b. The Contractor shall provide the specified material and equipment or an approved equal. When equal equipment or material is proposed the submittals shall be complete with descriptive and technical data sufficient to demonstrate quality and performance beyond question. The burden of proof in questions of equality lies with the Contractor, and the sole judge of equality shall be the Engineer's.

09 PROTECTION OF MATERIALS AND EQUIPMENT:

a. Contractor shall properly protect all equipment, materials, specialties, etc., from the elements and other causes during shipment, storage, and erection until final acceptance by the Owner and any damages or losses incurred by these or other causes shall be the Contractor's responsibility.

10 INTERFERENCE:

a. The Drawings accompanying these Specifications are generally diagrammatic and do not show all details such as hangers, couplings, bolts, nuts, connections, etc., required for the completed work. The Contractor shall be responsible for arranging his work so as to avoid interference with doors, windows, structural members, equipment, lights, and/or other systems. It shall be assumed the Contractor is thoroughly competent and familiar with the class of work involved and has familiarized himself with the job conditions and its detailed requirements. The Contractor shall harmonize the work of the different trades so that interference will be avoided as far as possible, but in case interference develops, the Engineers shall decide which equipment must be relocated, regardless of which was first installed. Any changes shall be made without additional cost to the Owner. The Contractor shall carefully layout the work and be responsible for all locations, grades, and levels. He shall check all dimensions before starting any work and report any discrepancies or interferences to the Engineers for correction.

11 SINGULAR NUMBER:

a. In all cases where a device or part of equipment is herein referred to in the singular number (such as the "fan"), such reference shall be intended to apply to as many such devices as are required to complete the installation as specified and shown on the Drawings.

12 SAMPLES AND MATERIAL TESTS:

a. Samples of all materials shall be submitted in conformity with the applicable instructions covered in the "General Conditions" of these Specifications when requested by the Engineers.

13 TRANSPORTATION AND DELIVERY:

a. The Contractor shall provide and pay for all freight, express, trucking transportation, cartage and handling of equipment and materials. Materials, etc., shall be delivered to the job site in ample quantities to insure uninterrupted progress of the work. Extra handling and shipping expenses incurred in expediting materials, etc., to prevent interruption of the overall job progress shall be paid for by the Contractor.

14 ORDINANCES, CODES AND PERMITS:

a. The Contractor shall obtain and pay for all permits and licenses (but not permanent easements), pay all fees and taxes, and give all notices bearing on the conduct of the work as drawn and specified. Certificates of compliance, approval or acceptance from all authorities having jurisdiction over the work shall be obtained and delivered to the Engineers.

b. All work indicated on the Drawings and/or herein specified shall conform with the Occupational Safety and Health Standards of the U.S. Department of Labor and all applicable ordinances, laws, regulations, and/or codes of the City of Athens , the State of Georgia, and National Fire

Protection Association, or any other governmental bodies having jurisdiction and shall be installed to the satisfaction of the inspecting authority having jurisdiction.

c. The Contractor shall promptly notify the Engineers in writing of any instances in the Specifications or on the Drawings that are in conflict with any of the aforementioned authorities so that any required changes shall be adjusted before the Contract is awarded. If the Contractor performs any work contrary to such laws, rules, or regulations without notice, he shall bear all cost arising therefrom.

d. The applicable codes and/or laws shall govern the minimum requirements only. Where the Drawings and/or Specifications call for materials, vents, piping, sizes, etc., in excess of the code requirements, the Drawings and Specifications shall be followed.

15 WORKMANSHIP:

a. All equipment, materials, specialties, etc., shall be installed and connected in accordance with the best engineering practice and standards for this type of work. Unless otherwise specified or shown on the Drawings, the recommendations and instructions of the manufacturer shall be followed for installing the work.

b. All persons employed for this work shall be competent, orderly and satisfactory to the Owner. All work shall be performed by men particularly skilled in the class of work to be performed.

c. Should any employee of the Contractor or his subcontractors, in the opinion of the Engineers, give evidence of disloyalty, carelessness, or incompetency, that employee or employees shall be permanently dismissed from this project.

d. Contractor shall at all times be responsible for enforcing good discipline and order among his employees, and employees of his sub-contractors.

e. Contractor shall keep a competent superintendent and any necessary assistants, satisfactory to the Owner and the Engineers, in charge during the progress of the work. Contractor's superintendent shall properly coordinate and time the mechanical work with the work of other trades and in particular with concrete, masonry, and form work to avoid errors and delays. Contractor shall pay cost involved due to his failure to comply with these requirements or due to his failure to acquaint himself with the work and progress of the other trades.

f. Should any dispute arise as to the quality or fitness of any material or workmanship, the decision shall rest with the Engineers.

16 INSPECTION AND TEST:

a. The Contractor shall test all of the equipment installed under this Specification and demonstrate its proper operation to the Engineers. No shop or final inspection or test shall be made except upon formal notice delivered to the Engineers by letter or telegram at least 48 hours prior to such test. No consideration will be given to notices from sub-contractors.

b. Contractor shall furnish all required labor, testing, instruments and devices as required for test and shall pay for all expenses involved in conducting such test. If tests show that the work or equipment is defective or at variance with the Specifications or Drawings, the Contractor shall immediately make all changes necessary to correct the work and performance to the satisfaction of the Engineers.

c. Contractor shall be given a reasonable time to correct any defects in materials or in performance or equipment and if such defects or performance requirements are neglected on the part of the Contractor, the right is reserved to have defects remedied or changes made and to charge the cost of same against the account of the Contractor.

d. All equipment will be inspected by the Engineers after delivery and before installation. Any equipment found not to be in accordance with Contract requirements and if damaged in any way will be rejected and satisfactory equipment must be provided thereafter without additonal cost to the Owner.

e. The Engineers and their authorized representatives shall at all times be provided with safe access by the Contractor to the work wherever it is in preparation or progress.

17 OPERATING AND MAINTENANCE INSTRUCTION MANUALS:

a. Furnish to the Engineers five (5) sets of printed, mimeographed, or multilithed instruction books on a good grade of paper together with spare parts lists, maintenance instructions, and approved shop drawings bound in hard back form covering such items of equipment and the operation of each system in detail.

18 TOOLS AND SPECIAL WRENCHES:

a. Contractor shall provide one complete set of any special tools and wrenches required to normal operation, adjustment, and maintenance of each dissimilar piece of equipment. Each set of such tools and wrenches shall be contained in a suitable metal tool box and shall be delivered to the Owner's authorized representative at the completion of the work.

19 LUBRICATION:

a. After the systems and equipment have been installed, all motors and equipment requiring oil or grease which were furnished and installed and/or installed by the Contractor shall be properly lubricated by the Contractor with lubricants as recommended by the manufacturer.

20 SPECIALIZED SERVICES:

a. As herein specified, or as otherwise required, the Contractor shall provide any necessary specialized services, such as accredited direct factory representative or manufacturers as may be required for supervision of erection and/or adjusting and placing equipment in operation.

21 CLEANING UP:

a. After the equipment, etc., have been set and ready for use and before final inspection is made, the Contractor shall thoroughly clean all equipment, conduit, etc. All plaster, paint, stickers, rust, stains, and other foreign matter or discoloration shall be removed and the systems left in clean and acceptable condition and ready for use.

22 CUTTING, PATCHING, CARPENTRY, AND MASONRY WORK:

a. The Contractor shall do all cutting, patching, carpentry, and masonry work required for the work and all shall be done as required by the job progress. All patching shall conform to the surrounding surfaces in every respect, including painting, tiling, etc. No cutting or patching shall be performed without first obtaining approval of the Owner's authorized representative and cutting and patching of new concrete or masonry will not be permitted unless absolutely necessary.

23 MOTORS AND MOTOR CONTROL EQUIPMENT:

a. All motor and motor control equipment shall conform with the requirements of the Electrical System Section of these Specifications.

b. All starters, pushbutton stations, switches, etc., shall be marked with laminated plastic labels on their covers with a suitable name, number, or other legend to indicate which piece of equipment the apparatus controls or regulates.

c. Unless otherwise specified to the contrary, all motors to be furnished by this Contractor shall not exceed 1800 RPM, and shall have open dripproof type frames. All motors shall meet NEMA standard for continuous duty and shall be as manufactured by Westinghouse, General Electric, Louis Allis, or approved equal. Where required, motors shall be provided with cast iron or steel bases having slide rails and screws for adjusting belt tension.

d. Except as otherwise specified or indicated, motors shall be furnished for operation with the following characteristics:

(1) 1/2 HP and larger 460 volts, 3 phase.
(2) 1/3 HP and smaller 115 volts, single phase.

e. Motors for operation on three phase current shall be of the squirrel-cage induction type, for normal starting torque and normal starting current.

f. Motors for operation on single phase current shall be of the repulsion induction type or capacitor type as required.

g. Each motor shall be equipped with a conduit terminal box of ample size with removable cover to permit easy access to external connections.

h. Starters, pilot devices, and like control devices, required for this work, shall be furnished and labeled under the Section under which the motor is furnished.

24 MOTOR CONTROLLERS:

a. Motor controllers shall be General Electric, Allen-Bradley Co., Allis-Chalmers Manufacturing Co., Westinghouse Electric Co., Cutler-Hammer, or approved equal.

b. Motors 1/2 HP and larger: Full voltage magnetic starters with 3 overloads in combination with a properly sized 3 pole molded-case circuit protector complete with a 120V. control transformer and one extra auxiliary contact, all in a NEMA 12 enclosure unless otherwise indicated. Starters shall have stop-start pushbuttons or hand-off automatic switches with red pilot light in starter covers, as indicated on the Electrical Drawings.

c. Motors 1/3 HP and smaller: Full voltage manual starters with built-in overload protection and neon pilot light. Starters shall be in NEMA 1 enclosure in finished areas and NEMA 4 enclosures in unfinished areas. Starters for motors interlocked to be started by other motors shall have a hand-off-automatic switch in the starter cover, as indicated on the Electrical Drawings.

25 LEVELING:

a. The Contractor shall level and align all equipment in accordance with the respective manufacturer's published data.

26 EXECUTION OF WORK:

a. In the execution of the work under this Contract, the Contractor shall take all precautions to avoid damage to the buildings and services, roofs, and roofing.

27 OPERATING TESTS:

a. In addition to any other tests herein specified, each system, after completion, shall be tested in operation for at least fifteen (15) days and shown to be in satisfactory operating condition.

b. The Contractor shall maintain a competent man at the project after the operation of the system has started to properly instruct the operating personnel in the correct operation of the equipment, apparatus, and systems. Should any of the equipment or apparatus, furnished by the Contractor, require the services of a Factory Representative for installation or placing in proper service and/or adjustment, the Contractor shall provide same without additional cost to the Owner.

28 PAINTING:

a. Except as otherwise specified all field painting for work under this Section shall be performed under the "Painting" Section of these Specifications.

b. The Contractor shall prepare all material and equipment under this Section for painting and all nameplates, etc., shall be carefully masked to prevent the painting-over or obscuring of same.

29 FIRE DETECTION THERMOSTATS (FIRESTATS):

a. An Underwriter's listed fire detection thermostat shall be installed for exhaust fans 1 and 2. Thermostats may have fixed or adjustable setting and must operate at not more than 50 degrees F. above the normal maximum temperature at their location.

b. Thermostats shall be the manual reset type.

c. The entire installation shall conform to the requirements of NFPA Pamphlet 90A.

30 DAMPERS (MOTORIZED):

a. Dampers of the opposed blade type shall be furnished and installed where shown on the Drawings.

(1) Damper frames shall have 2 x 1/2 x 1/8 inch galvanized steel channel heads, sills and jambs.
(2) Blades shall be constructed of 16 gauge galvanized steel, crimped on all edges to minimize leakage, and provided with stops to prevent overrun.
(3) Blades shall be a maximum 10 inches wide. Shafts shall be 1/2 inch diameter galvanized steel the full length of the blade. Stiffeners shall be provided over the shafts. Blades and stiffeners shall be riveted or welded to the shafts.
(4) Shafts shall be set in oil impregnated sintered bronze bearings designed to take thrust.
(5) Dampers shall be complete with anti-leakage side stops.
(6) Linkage shall be constructed of 5/16 inch diameter galvanized steel rods with plated steel brackets and brass barrels.
(7) All necessary interconnecting linkages, adjustable with locking devices shall be provided to make all sections of a unit open wide, close tightly and move smoothly as a unit. One blade shaft shall be extended through an additional bearing to operate the unit.
(8) Motor operated dampers shall be complete with linkage as required for operation by the damper motors.
(9) Dampers shall be as manufactured by American Warming and Ventilating, Inc., Construction Specialties, Airolite, Ruskin, Air Balance or approved equal.

31 TESTS AND ADJUSTMENTS:

a. Air systems shall be properly balanced and adjusted; reasonably airtight; and free from pulsation, chatter and objectionable vibration at the specified ratings.

(1) Inlet shall be adjusted to give the air quantity shown on the Drawing.
(2) Fan speed shall be adjusted so that the fan delivers the required capacity against the actual resistance of the system. Belt drive shall be left in proper adjustment for belt tension as well as equipment speed.
(3) Controls shall be calibrated so that the set point device in each control is accurate. Changes in calibration settings shall be made only with calibration devices.
(4) Damper linkages and motors shall be adjusted to provide the specified air flows.

32 ROOF EXHAUST FANS:

a. The fans shall have a non-overloading aluminum wheel and shall be statically and dynamically balanced at the factory. Unit shall have a die formed aluminum hood and fan motor shall be mounted on vibration eliminators. Unit shall be complete with backdraft dampers, bird screen and integral disconnect switch. The fans shall be as manufactured by Loren Cook or approved equal.

33 WALL EXHAUST FAN:

a. Fan shall have 100 percent weatherproof construction with necessary flashing, drains, etc. The unit shall be equipped with a non-overloading aluminum fan wheel and shall be statically and dynamically balanced at the factory. Unit shall be all aluminum construction and shall be complete with backdraft dampers, disconnect switch and inlet grille. The fan shall be as manufactured by Loren Cook or approved equal.

34 ELECTRIC UNIT HEATERS:

a. The Contractor shall furnish and install Modine or approved equal, electric unit heaters of the type, size, capacity and voltage specified on the drawings. Heaters shall be installed and wired according to the manufacturer's recommendations and applicable national and local codes.

b. Unit shall have a draw formed steel casing, be corrosion-resistant, and finished with a gray-green baked on enamel. Enclosure shall contain heating elements, contactors and control circuit transformer (where required). A wiring diagram and grounding lug shall be included in control compartment.

c. Each unit shall have a motor and propeller. The motor shall be totally enclosed, continuous duty, with automatic re-setting, thermal overload protection. Propeller fan shall be directly connected to the motor shaft and be statically and dynamically balanced.

d. Removable and adjustable horizontal air deflectors shall be furnished on all models.

35 BATHROOM WALL HEATER:

a. The unit shall have 20 gauge steel housing with anodized aluminum frame and neutral grey baked enamel grille finish. The housing shall enclose the metal sheath heating element, the fan and the shaded 2-pole motor. The unit shall have automatic reset thernal overload protection and a heavy-duty thermostat with 'click' off position. The unit shall be recessed wall mount type. The unit shall be as manufactured by Emerson-Chromalox or approved equal.

36 CONTROLS:

a. Exhaust Fans EF-1, EF-2 and Unit Heaters UH-1, UH-2, UH-3:

(1) When the thermostat is set in the "Heating" position, on a fall in space temperature below thermostat set point, the unit heaters will operate through their contactors. When the thermostat is set in the "cooling" position, on a rise in space temperature above thermostat set point, the motorized louver shall open and the exhaust fans shall start. A hand off automatic switch shall be provided to start fans during heating periods, if needed.

(2) The exhaust fans and Unit Heaters shall be controlled from a heating/coolin thermostat as manufactured by Honeywell, Series T605 with Series Q651 subbase, or approved equal.

b. Exhaust fan EF-3 and Unit Heater UH-4:

(1) Same sequence of operation as stated in a. above.

SECTION 15B

PLUMBING SYSTEM

01 GENERAL:

a. SPECIAL CONDITIONS and GENERAL CONDITIONS shall govern the work under this Section.

02 SCOPE:

a. The Contractor shall furnish and install materials, equipment, and labor required for a complete plumbing system, including all plumbing fixtures, soil, waste, drain and vent piping, water piping, floor drains, valves, hangers, fittings, etc., as indicated on the drawings and/or as specified herein. This shall include all incidental items not ordinarily specified but necessary for the complete installation.

03 CODE REQUIREMENTS:

a. All work indicated on the drawings and/or herein specified shall conform with all applicable codes and/or laws of the State of Georgia or any other governmental bodies having jurisdiction and shall be installed to the satisfaction of the inspecting authority having jurisdiction. Any deviations from the drawings and/or specifications required for conformance with the applicable codes and/or laws shall be made without change in contract price, but not until such deviations have been brought to the attention of the Architect and Engineer. The applicable codes and/or laws shall govern the minimum requirements only. Where the drawings and/or specifications call for materials, piping, sizes, etc., in excess of the code requirements, the drawings and specifications shall be followed.

04 INSTALLATION REQUIREMENTS:

a. Special attention is directed to the requirement that all equipment and materials mentioned in these specifications and/or indicated on the drawings shall be furnished, except where otherwise specifically noted, completely installed, adjusted, tested, and left in a safe and satisfactory operating condition. All equipment, accessories, appliances, and connections necessary for the successful operation of the equipment shall be furnished and installed as a part of the work to the complete satisfaction of the Architect and Engineer.

05 SPACE REQUIREMENTS:

a. All apparatus, equipment, piping, etc., shall fit into the space provided in the building or within the property and shall be installed at such time and in such manner as to avoid damage to the building structures or property and as required by the job progress. Equipment, apparatus, and accessories requiring normal servicing or maintenance shall be made easily accessible. All piping, etc., must be kept as close as possible to walls, ceiling, columns, etc., so as to take up a minimum amount of space. All offsets, fittings, etc., required to accomplish this shall be furnished and installed at no additional cost to the Owner.

06 SHOP DRAWINGS:

a. To insure compliance with the intent and requirements of these Specifications, the Contractor shall, before purchasing materials and equipment, submit lists of the products proposed for use in the installation. Lists shall be accompanied by bulletins, plates, drawings, and schedules which shall indicate the relative characteristics and rating with capacities of the respective items of equipment. When standard equipment is modified to suit the conditions required by the Drawings or Specifications, the lists shall be supplemented with certification from the manufacturers indicating the operating conditions, rating, and capacity of the equipment proposed. Six (6) copies of the lists, drawings, cuts, etc., shall be submitted to the Architect and Engineer for appropriate action and distribution.

b. If any departures from the Contract Drawings are deemed necessary by the Contractor, the details of such departures and the reasons therefore shall be submitted in writing as soon as practicable to the Architect and Engineer for approval; otherwise, no such departures shall be acceptable.

c. Shop drawings shall show plans and elevations, roughing-in dimensions, and materials of fabrication. Shop drawings submitted by the Contractor shall be checked for accuracy and coordinated with other work and corrected if necessary before submission to the Architect and Engineer. Approval of shop drawings or equipment schedules by the Architect and Engineer shall not relieve the Contractor from the responsibility for errors of any kind on his part of the responsibility for meeting the intent of the Specifications and Contract obligations.

07 INTERFERENCE AND WORKING DRAWINGS:

a. The Drawings accompanying these Specifications are generally diagrammatic and do not show all details such as hangers, couplings, bolts, nuts, connections, etc., required for the completed work that the Contractor shall furnish and install. It shall be assumed the Contractor is thoroughly competent and familiar with the class of work involved and its detailed requirements.

b. All necessary offsets, fittings, etc., in piping, ductwork, etc., required to properly install the work must be furnished and all piping kept as close as possible to walls, ceilings, columns, etc., so as to take up the minimum amount of space. All offsets, fittings, etc., required to accomplish this shall be furnished and installed at no additional cost to the Owner.

c. The drawings accompanying these Specifications indicate generally the location of the machinery, equipment, etc., and while these drawings shall be followed as closely as possible, all dimensions shall be checked and any necessary changed shall be made to comply with structural conditions, equipment to be installed, other services and/or systems, equipment furnished, etc., without additional cost to the Owner and as directed. Contractor's shop drawings shall indicate the proposed changes.

d. The Contractor shall harmonize the work of the different "trades" so that interference will be avoided as far as possible, but in case interference develops, the Resident Inspector shall decide which equipment, piping, conduit, etc., must be relocated, regardless of which was first installed.

08 MARKED-UP DRAWINGS:

a. As work progresses, record on one set of the drawings all changes and deviations from the drawings in size, location, etc., of all piping and other equipment. Record final location of piping, valves, etc., by scale to walls. Make sufficient measurement to definitely locate all equipment. Locate underground lines by dimension from building walls. The Contractor shall furnish field measurements locating all piping inside and underground, valves, cleanouts, junctions, etc. Unless otherwise specified, return one complete set of as-built drawings to the Architect and Engineer after the project is complete.

09 INSTALLATION:

GENERAL CONSTRUCTION

a. Horizontal sanitary, waste, drain, and vent piping shall be installed with a minimum fall of 1/4" per foot unless otherwise indicated or directed by the plumbing inspector or the Resident Inspector. Where any elevations of lines are indicated on the drawings, lines shall be graded uniformly between invert elevations.

b. Changes in pipe size on soil, waste, vent, and drain piping shall be made with reducing fittings or recessed reducers unless otherwise required by the applicable plumbing code. Bushings shall not be used.

c. Changes in horizontal direction of soil, waste, and drain piping shall be made with long radius fittings, or with Y-branches and 1/8 or 1/16 bends, or a combination of both. Where special fittings are required, they shall be provided by the Contractor.

10 PIPING AND FITTINGS:

a. Install systems as shown. The Sanitary and drain systems shall be installed to a point five (5) feet outside of the building and connected to lines specified in Section 2 of these Specifications. The Domestic cold (city) water system shall be installed to a point five (5) feet outside of the building and connected to lines specified in Section 2 of these Specifications or terminated as indicated on the drawings.

b. All piping shall be run true to grade and shall be arranged to make the best possible appearance. Except where otherwise required by conditions of installation, all piping shall be symmetrical and/or parallel with lines of the building or structures in which it is installed.

c. All underground piping shall be installed so that a true surface is given to the inverts throughout the entire lengths of the mains between vertical offsets.

d. Pipe shall be fabricated to measurements established on the job and shall be carefully worked into place without springing or forcing. Adequate provision shall be made for absorbing all expansion and contraction without undue stress in any part of the system.

e. The interior surfaces of all piping shall be kept clean at all times. Pipe shall be free of fins and burrs. Pipe shall be cleaned by hammering and shaking or swabbing, or by a combination of methods. All lines shall be blown out after erection, but blowing out shall not be relied upon for removing excessive quantities of foreign matter. During the progress of construction, open ends of pipe, fittings, etc., shall be properly protected at all times to prevent the admission of foreign matter.

f. No unions shall be placed in piping in a location that will be inaccessible after completion of the work. Unions shall be provided on each side, at each item of equipment, or other locations where dismantling of equipment or specialties may be necessary.

g. All valves shall be properly packed and made leakproof. The residual amount of packing, after testing, shall be sufficient to permit not less than 50% future "take-up" of the total design depth of stuffing box.

h. All piping and/or equipment shall be properly supported and guided. Hangers and/or supports shall be provided near each change of direction. Supports shall be so located or shall be of such type as not to unduly restrict the movement of the pipe due to lateral or longitudinal expansion. Hangers shall be uniformly spaced and symmetrically arranged.

i. The Contractor shall provide all supplementary and/or intermediate steel or other structural members as may be required for transmission of loads to members forming part of the building structures. Methods of framing and/or interconnection are subject to approval.

j. All welding shall be performed by qualified welders, in accordance with the standards of the American Welding Society, and each pipe welder shall be qualified to perform any of the welding required irrespective of pressure or position classification. Each welder shall possess a currently approved certificate issued by an acceptable testing authority. Satisfactory evidence as to qualifications and certificate possession shall be presented to the Resident Inspector for each welder employed.

k. An approved means of preventing electrolysis shall be provided at all connection points between dissimilar metals in pipe, fittings and hangers.

l. Drain valves shall be installed at the low points of the water piping system. These valves shall be in an accessible location to provide a means of draining the water lines to facilitate recharging of the air chambers, where used, or draining the system.

11 FLASHING:

a. All pipe passing through a roof shall be flashed and counterflashed in an approved manner. Flashing shall be perfectly watertight.

b. Any cutting and repairing of roofing shall be performed by qualified roofers and shall comply with all requirements necessary to leave roofing in equal condition as it existed before the roofing was cut.

c. Lead flashing shall be used for all plumbing pipes passing through roof. Flashing shall be of sheet lead weighing not less than six (6) pounds per square foot. Lead flashing shall be not less than twenty-six inches (26") square and shall extent up and into hub, or end of pipe, and shall be properly caulked. Caulk at least a one-foot extension of cast iron pipe into each vent connection above hub in which lead flashing is caulked. Where pipes, other than plumbing vents, pass through roof, flashing shall be two section, cone type made of not less than 20 ounce copper. Base flashing shall extend not less than 8 inches beyond the periphery of the pipe. Cap or counterflashing shall be clamped to the pipe.

12 CUTTING, PATCHING, CARPENTRY, AND MASONRY WORK:

a. The Contractor shall do all cutting, patching, carpentry, and masonry work required for the work and all shall be done as required by the job progress. All patching shall conform to the surrounding surfaces in every respect, including painting, tiling, etc. No cutting or patching shall be performed without first obtaining approval of the Resident Inspector and cutting and patching of new concrete or masonry will not be permitted unless absolutely necessary.

13 CLEANING UP:

a. After the fixtures, equipment, etc., have been set and ready for use and before final inspection is made, the Contractor shall thoroughly clean all fixtures, equipment, piping, covering, etc. All plaster, paint, stickers, rust, stains, and other foreign matter or discoloration shall be removed and the systems left in clean and acceptable condition and ready for use.

14 TRENCHING AND BACKFILLING:

a. Trenching and backfilling shall be in accordance with the EARTHWORK Section.

b. Bell holes shall be provided in trenches at all joints in cast iron pipe to facilitate caulking and so that pipe will not be supported only at the joints. Trenches shall be uniformly graded where necessary so that pipes will have solid bearing along their entire length.

15 MATERIALS, MANUFACTURER'S NAMES:

a. All materials shall be new and of best grade. Manufacturer's name, model numbers, etc., as specified herein are for the purpose of describing the type, capacity, function and quality of materials to be used, and not intended to exclude equal products of other reputable manufacturers.

16 PIPE, VALVES, AND FITTINGS:

a. Pipe, valves, and fittings shall be of new construction and of the latest design for the service specified. Valves shall be of one manufacturer: Jenkins, Powell, Crane, Walworth or Lunkenheimer. Piping for the various types of service shall be as follows:

(1) Domestic cold (city) water piping inside building and to water meter outside of building, size 1-1/2" and smaller:

- (a) Construction shall be suitable for water working pressure of 200 pounds. Piping shall be "sweat" type construction made with a suitable solder.
- (b) Pipe shall be "Type L" hard drawn copper tubing ASTM Specification B-88.
- (c) Fittings shall be "sweat" type wrought copper fittings.
- (d) Valves shall be all brass or bronze solder ends for 150 pounds steam working pressure. Gate, globe and check valves shall be Jenkins Brothers 1242, 1200, and 1222, respectively, or approved equal.

(2) All soil, waste, vent, and drain piping inside of building and to 5'-0" outside of building:

- (a) Construction shall comply with the applicable codes, but shall be suitable for not less than 15 psi.
- (b) Pipe shall be extra heavy weight bell and spigot cast iron soil pipe conforming with ASME Standards. Pipe shall be coated where concealed and uncoated where exposed and and painted.

(c) Fittings shall be cast iron soil pipe fittings of same requirements and weight classification as pipe.

(d) Valves - none required except as indicated or specified on the drawings.

17 PIPE JOINTS:

a. Joints for cast iron soil pipe and fittings shall be caulked, made with gaskets or picked oakum and not less than 12 oz. of ingot lead for every inch of diameter of pipe. All joints shall be made perfectly air and water tight.

b. Joints between lead pipe and cast iron pipe shall be made with approved brass ferrules solder-wiped to the lead pipe and caulked into the hub of the iron pipe.

c. Joints in lead pipe shall be solder-wiped joints. Joints between lead pipe and wrought iron or brass pipe fittings shall be made with heavy brass male soldering nipples.

d. An approved means of preventing electrolysis shall be provided at all connection points between dissimilar metals in pipe, fittings, and hangers. Pipe joints between dissimilar metals shall be made with EPCO, or approved equal, electrically insulated couplings.

e. Joints in copper piping shall be sweat type using solder and flux of the same manufacture made up in accordance with the manufacturer's recommendations. Solder shall be 95-5 tin-antimony.

f. Threads of screw jointed piping shall be full, clean, sharp, and true. The joints shall be made up with an approved pipe joint compound with the minimum number of threads left exposed, and all joints shall be leak-proof. Special joint compounds shall be used where hereinafter specified.

18 PROTECTIVE COATINGS:

a. All galvanized metal on which the galvanizing has been damaged in any way either by normal fabricating procedures or by accident shall have the damage areas coated with "Carbo Zinc No. 11" as manufactured by the Carboline Company. Coating shall be applied in strict accordance with the manufacturer's recommendations.

19 FIXTURES AND EQUIPMENT:

a. Fixtures and equipment not furnished with integral stops shall have full size stop or shut-off valve furnished for each supply connection, including equipment furnished by others. Batteries or groups of fixtures and major branches shall be provided with gate valves.

20 CLEANOUTS:

a. Cleanouts shall be provided where indicated on the drawings and where required by the applicable plumbing code. Cleanouts in cast iron soil pipe lines shall consist of cast iron ferrule and heavy brass cleanout plug with square head. Where piping is concealed in floors or walls, cleanouts shall be installed flush with floors or walls and shall have countersunk plugs. Cleanouts shall be Josam Manufacturing Company's No. 58560 for unfinished floors and No. 58710-22 for walls. Cleanouts in finished floors and toilet area shall be Josam Manufacturing Company's No. 58700-22-10. Cleanouts shall be the same size as pipe line in line sizes 4" and smaller. Pipe lines larger than size 4" shall have 4" cleanouts.

21 FLOOR DRAINS:

a. Installation of floor drains shall be coordinated with the concrete work to assure proper drain elevation and floor slope. Floor drains shall be cast into the concrete at the time the floor is placed and shall be made watertight.

b. Floor drains shall be cast iron with double drainage flange, weepholes, and inside caulk bottom outlet. Floor drains shall be provided with clamping device where floor is not on earth or where waterproofing membrane is used. Size and type of floor drains shall be as specified on the drawings.

c. TYPE I - Floor drains shall have an adjustable collar with rolled thread and an 11" diameter, heavy duty, anti-tilting, cast iron "Super-Flo" grate with a free drainage area of 61 square inches and shall be Josam Manufacturing Company's No. 31200.

d. Floor drains as manufactured by Zurn Industries, Inc., or Wade Mfg. Co. equivalent to those specified will be acceptable.

22 PIPE SLEEVES, FLOOR, WALL AND CEILING PLATES:

a. Provide and install standard weight steel pipe sleeves where pipes pass through walls or masonry partitions. The sleeves shall be of such diameter as to allow pipes to pass through easily and allow not less than 1/4" space between pipe and sleeve. Sleeves shall be of sufficient size to allow for pipe insulation between the pipe and the sleeve where pipes are insulated. Sleeves shall be located so as not to interfere with other sleeves. Sleeves shall be firmly grouted in place during the construction of the masonry walls, etc. No beams shall be cut or sleeved without approval by the Engineer.

b. Except as otherwise specified or noted, sleeves shall be fabricated of Schedule 40 black steel.

c. Sleeves through floors which are waterproofed with a membrane type waterproofing, shall consist of Josam Manufacturing Company's or approved equal, Series No. 26430, 26420 or 26410 flashing clamp installed at the proper level with standard weight wrought iron pipe sleeve down to bottom of slab and up to 3 inches above finished floor. Sleeves shall be flashed with 6 pound lead flashing not less than 24 inches square installed in accordance with the membrane requirements. Space between pipe and sleeves shall be sealed in an approved manner. Where job requirements are such that two or more pipes must pass through a waterproofed floor in such proximity that individual flashing sleeves cannot be installed, special flashing sleeves shall be fabricated and shop drawings shall be submitted for Approval.

d. Provide cast iron or cast brass floor and wall plates with set screws for holding in place where pipes pass through floors or walls, and chromium plated spun steel escutcheon plates with springs on all lines in finished spaces. All exposed fixtures, supplies, and wastes through walls shall be fitted with chromium plated spun steel escutcheon plates with springs. Where lines are insulated, the plates shall be of proper size to fit over the insulation.

23 PIPE HANGERS AND SUPPORTS:

a. Pipe hangers and accessories shall be the approved equivalent of the Grinnell Company or Fee and Mason, and all hangers shall be the adjustable type. Hangers on insulated lines shall be sized so that hanger shall fit over insulation. Generally, except as otherwise specified or indicated on the drawings, supports for horizontal and vertical piping shall be as follows:

(1) All piping size 2" and smaller, except bare copper tubing; soil pipe of all sizes, Grinnell Fig. No. 104, or approved equal.

(2) All bare copper tubing, Grinnell Fig. No. CT-99, or approved equal.

(3) Horizontal runs of copper tubing shall be supported on not exceeding 6-foot centers for pipe sizes 3/4 inch and less, 8-foot centers for pipe sizes 1 inch and 1-1/4 inches, and 10-foot centers for pipe sizes 1-1/2 inches and larger.

(4) Horizontal runs of cast iron soil pipe shall be supported on not exceeding 5-foot centers with hanger placed behind soil pipe hub.

(5) Cast iron waste and vent stacks shall be supported at floor by means of a heavy iron clamp, Grinnell Company Fig. 261.

(6) Vertical piping shall be supported and/or guided on not exceeding 15-foot centers for pipe size 2" and smaller, and 20-foot centers for pipe sizes 2-1/2" and larger. "Free end" risers shall be guided near free end and at intermediate points as required. Vertical piping to equipment shall be rigidly supported.

(7) Except where used for anchor purposes or supports for vertical pipes, any pipe clamp type hanger shall be a free fit on the pipe and proper spacers shall be used to prevent binding.

(8) Perforated strap hangers will not be permitted.

(9) The Contractor shall furnish and install any intermediate supporting steel necessary for properly supporting, guiding or anchoring the complete piping systems or equipment.

(10) Beam clamps shall be used for supporting pipes from structural steel members; no punching or burning of holes in building structural steel members for pipe or equipment supports will be allowed. Beam clamps shall be Grinnell Fig. No. 226, 225, 265, or 292 as best suited to conditions with jaw sized for the structural member. No C-clamps will be permitted, except by special permission. Where Contractor provides supplemental steel angles for pipe supports, pipe may be supported from holes drilled in the angles.

(11) All equipment and piping suspended from new overhead concrete construction shall be suspended from cast-in-place steel inserts in the concrete construction. Inserts shall be Grinnell Fig. No. 282 or 281.

(12) The Contractor shall furnish any special pipe or equipment supports required for properly supporting, guiding or anchoring all piping and equipment and details of such supports shall be submitted for approval.

24 WATER HAMMER ARRESTERS:

a. Each fixture supply shall be fitted with an air chamber 18" long, one pipe size larger than supply piping. Fixtures in battery may be served by one air chamber 24" long at end of full sized water header, in lieu of air chamber for each fixture supply. The Contractor may use shock absorbers in lieu of air chambers provided that they are sized and installed in accordance with the recommendations of the Plumbing and Drainage Institute. The size and location of shock absorbers have been diagramatically shown on the drawings and does not alter the use of air chambers, provided that there is access to permit drainage and recharging of air chambers.

b. Where shock absorbers are used, they shall have elastomer bellows, hydraulic displacement fluid, and a gaseous pressurized dispplacement cushion encased in a stainless steel shell and shall be Josam Manufacturing Company's Series 75000 or approved equal.

25 BACK FLOW PREVENTERS:

a. Where back flow prevention is necessary or where codes require the use of back flow preventers the Contractor shall provide and install a Watts Regulator Company's, or approved equal, back flow preventer. Back flow preventers shall be installed in any domestic water service line as near to valve or fixture as possible where the back flow prevention is required. The Contractor shall provide a Watts Regulator Company's Series 900, or approved equal, reduced pressure type backflow preventer at water stations where indicated on the drawings and as detailed.

b. All surface mounted wall hydrants outside building shall be Josam Manufacturing Company's Model 71050-74 cast bronze, heavy duty, exposed type wall hydrant with polished face, bronze wall casing, bronze working parts, renewable nylon seat, 3/4" HPT hose outlet, 3/4" IPS outside thread inlet, integral vacuum breaker, ground joint union elbow adapter, and "T" handle key.

26 FIXTURE CONNECTIONS AND SUPPORTS:

a. Wall outlet fixtures other than water closets shall be connected to cast iron soil and waste piping by means of extra heavy lead bends using solder-wiped joints and brass ferrules. Lavatory waste line may be connected to the waste stacks by means of DWV copper pipe and fittings.

b. Each wall-mounted fixture shall be adequately supported by means of a carrier, and each floor mounted fixture shall be set solidly upon the floor, bearing evenly around its entire base.

27 PLUMBING FIXTURES:

a. Furnish and install all plumbing fixtures complete with equipment, fittings, trimming, etc., as indicated or specified and as approved. The list of fixtures proposed shall be submitted to the Architect and Engineer for approval before fixtures are purchased from any manufacturer. All fixtures shall be Grade "A". The name and trademark of the manufacturer shall be printed or pressed on all closets and lavatories, and a label which cannot be removed without destroying it, containing the manufacturer's name or trademark, and the quality or class of the fixtures, shall be affixed to all fixtures and not removed until after the work is accepted. The Contractor shall be held responsible for the actual number of fixtures that shall be furnished and installed, or those for which rough-in requirements are necessary, all as indicated on the plumbing and architectural drawings, or herein specified. All exposed metal parts shall be chromium plated.

(1) F-1 Water Closet. "American Standard" catalog no. 2109.395 "Water-Saver Cadet" genuine vitreous china elongated, full siphon jet floor-mounted water closet with close-coupled tank fitted with catalog no. 5320.932 (Plate 9900) "Church" white Mol-Tex open front seat with check hinge and chromium plated nuts and washers, and "American Standard" No. 3405.016 toilet tank supply with 3/8" angle valve, wheel handle, 3/8" male inlet, escutcheon, flexible tube riser, and chrome finish.

(2) F-2 Lavatory. "American Standard" catalog no. 0360.057 "Scotian", size 20" x 18", genuine vitreous china lavatory with 8" centers, front overflow, and soap depression; fitted with catalog no. 2285.054 single lavatory faucet with chrome 4-arm handles 1/2" inlet renewable seat, "C" index, and chrome finish; catalog no. 2303.154 lavatory supply with 3/8" inlet, escutcheon, flexible tube riser, and wheel control stop; catalog no. 2411.015 lavatory drain with integral perforated grid, 1-1/4" x 4" tailpiece, and chrome finish, catalog no. 4401.014 adjustable cast brass P-Trap with 1-1/4" inlet, 1-1/4" outlet, ground swivel joint, cleanout plug, slip inlet, and escutcheon; catalog no. 2578.011 lavatory faucet hole cover with chrome finish; and "Josam" carrier No. 17100.

28 TESTING:

a. In addition to any other tests herein specified, the systems, after completion, shall be tested in operation for at least three (3) days and shown to be in satisfactory operating condition. The plumbing system shall be tested as required by the applicable plumbing code and as hereinafter specified.

(1) The entire drainage and vent piping systems shall have all necessary openings plugged and the entire systems shall be filled with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop in water level greater than 4", with all joints and pipe being made free from leaks. Subject to the approval of the Architect and Engineer the drainage systems may be tested in sections.

(2) Water piping shall be tested disconnected from all fixtures and equipment at 150 psig water pressure for one (1) hour and in the presence of the Plumbing Inspector and Resident Inspector and to their satisfaction and shall be made free from leaks. Joints in copper piping found leaking shall be unsoldered, recleaned and resoldered. Screwed joints shall be remade. No caulking or wicking of screwed joints shall be permitted. Piping shall be retested until found tight.

SECTION 16A

ELECTRICAL SYSTEMS

01 SCOPE OF THE WORK:

a. The work, as indicated on the Drawings and as called for in these Specifications, shall provide complete and operable electrical systems including:

(1) Service and distribution facilities
(2) Power and control systems for motor-operated or other power consuming equipment
(3) Normal and emergency lighting systems
(4) Grounding system
(5) Lightning protection system
(6) Empty raceway system for telephones

b. The Systems, shall be completely installed, connected, tested, adjusted, and free of short circuits and unintentional grounds, properly maintained until final acceptance, and left in proper operating and usable condition. The Owner's designated personnel shall be instructed, as required, regarding operation and maintenance of the systems provided under these Specifications.

c. Materials to be furnished and installed shall generally include, but are not necessarily limited to, all conductors, raceways, fittings, circuit protective devices, wiring devices, fixtures, transformers, boxes, hardware, insulationg materials and equipment, supporting members and structures, and such other system components, appurtenances and miscellaneous equipment required by the Drawings and Specifications for the completed systems.

d. The work shall begin at the power company padmount transformer from where Contractor shall extend electrical service underground to the incoming cubicle of the building motor control center. Service shall be 480/277 volts, 3 phase, 4 wire, 60 Hertz, grounded "wye" connected.

02 CODES, PERMITS, FEES:

a. Requirements of the 1978 edition of the National Electrical Code-NFPA No. 70 (N.E.C.), all other applicable National Fire Protection Association National Fire Codes, the 1977 edition of the National Electrical Safety Code-ANSI No. C2 (N.E.S.C.), all applicable Federal and State laws, and all applicable local Codes and Ordinances shall govern the work under these Specifications. The requirements of the Drawings and Specifications shall govern where they exceed minimum Code requirements.

b. One copy of applicable Codes and at least one copy of Drawings and Specifications shall be provided by the Contractor at the job site during construction.

c. The Contractor is presumed to be knowledgeable of National and local Code requirements. If he believes any requirement of the Drawings or Specifications is not in conformance with Code or other applicable requirements, he shall so notify the Architect/Engineer before the work is installed. The decision of the Architect/Engineer in interpreting the Drawings and Specifications and Code requirements relating thereto for a specific application under this Contract shall be considered final.

d. The Contractor shall give all necessary notices, obtain all permits, pay all inspection and other fees required by governmental authorities having jurisdiction over the work under this Contract. Receipt of all required approvals, clearances and certificates by the Owner shall be a prerequisite to acceptance and final payment for the work.

03 INTERFERENCES:

a. The Contractor shall refer to all Architectural, structural, Mechanical and other Contract Drawings and Specifications for all construction details which have a bearing on his work. Failure by the Contractor to do so will not be considered as grounds for extra cost to the Owner or Architect/Engineer.

b. Interferences shall be avoided, since the Electrical Drawings are generally diagrammatic, by coordinating the work with that of all other trades and by the provision of all necessary raceway offsets, fittings, boxes, and minot adjustments in equipment, fixture, or other outlet locations, as approved, to accomplish the work in a satisfactory manner and to provide services at proper locations, all without additional cost to the Owner.

c. Where interference develops, the Contractor shall abide by the decision of the Owner's authorized representative regarding items to be relocated, regardless of which were installed first, without additional cost to the Owner.

04 MATERIALS AND WORKMANSHIP:

a. Materials furnished shall be new, shall be undamaged when installed, and shall conform with all established and applicable standards and test requirements of Underwriters Laboratories (U.L.), National Electrical Manufacturers Association (NEMA), and American National Standards Institute (ANSI), and the Institute of Electrical and Electronics Engineers (IEEE).

b. The term "U.L. listed" as used herein shall mean tested and listed by Underwriters Laboratories for the use intended. Generally, all such material shall bear the U.L. label or mark. Where special or custom-built requirements prevent the manufacturer from labeling the material, he shall provide, when requested, written certification that the material is safe and, except for the special requirements, thd material has been tested and is listed by U.L.

c. Workmanship shall be of the highest quality and no substandard work will be accepted. All work shall be done by properly supervised workmen skilled in the trades involved. What might be considered usual or customary or acceptable material and workmanship in work under other contracts shall have no bearing on work under this Contract, which is governed only by these Contract Documents.

d. Manufacturers' names and catalog numbers are used herein to establish type, style, and minimum quality of materials to be provided and, where followed by "or approved equal" (meaning approved by the Architect/Engineer) does not constitute a preference by the Owner or Architect/Engineer for the manufacturers named. Where "or approved equal" does not appear, materials of the manufacturer or manufacturers specified shall be provided. When materials of approved alternative manufacturers can be obtained at the same cost, the Owner reserves the right to select the manufacturer of the equipment to be furnished.

e. Each item of material or equipment shall be essentially the standard product of the manufacturer. Where two or more units of the same kind, type and/or class of material are required, they shall be the product of a single manufacturer; however, the component parts of the material need not be the product of a single manufacturer. Generally, the manufacturer shall only be the manufacturer of the major functional components and not one which merely purchases such components and provides basically only the housing and interconnections therefor.

f. Substitution of materials which reduce the quality, capacity, rating, reliability, flexibility, or which may increase maintenance costs of the electrical systems will not be accepted. Substitutions will not be approved for reason of long delivery time for specified items if the Contractor has failed within a reasonable length of time to place orders or to furnish the supplier or manufacturer all information necessary for the delivery of approved items. The final decision regarding the acceptability of substitute materials shall rest with the Architect/Engineer. Non-approved materials, if installed, shall be replaced with approved materials at the Contractor's expense.

g. A list of proposed materials with each item identified by manufacturer and catalog number and accompanied by catalog cuts, sketches, or other descriptive material, shall be submitted in quintuplicate by the Contractor to the Architect/Engineer for approval within 30 calendar days after award of the Contract and before beginning fabrication or installation of any materials. Material for which manufacturer's shop drawings are to be furnished at a later date shall be identified on the list by manufacturer's name and the type and class of material proposed.

h. Shop drawings of such items as motor control centers, panelboards, etc., prepared by approved manufacturers, shall be checked by the Contractor for compliance with Contract requirements, and as soon as possible submitted in quintuplicate to the Architect/Engineer for approval. Submitted shop drawings which indicate insufficient checking or disregard by the Contractor or manufacturer for requirements of the Contract Drawings and Specifications may be returned unchecked and disapproved to the Contractor for resubmittal.

i. Storage and protection of all materials from damage from all causes at all times during construction shall be the Contractor's responsibility. Equipment which might be damaged by high humidity shall be protected from the weather with polyethylene sheeting and electric heat until installed and permanently energized. Untaped stranded cable ends shall not be exposed to the weather. Temporary pallets or other suitable supports shall be provided to prevent all materials from being stored directly on the ground.

j. Copies of all maintenance manuals, equipment shop drawings, installation instructions, parts lists, operating instructions, control diagrams, and the like, shall be collected by the Contractor and delivered in good condition and properly identified to the Owner at completion of the Contract.

06 UNDERGROUND DUCTS AND DUCT BANKS:

a. All raceways installed underground shall:

(1) be rigid steel galvanized conduit;
(2) after being properly spaced, aligned, and firmly held in place, be encased with 3000 pound, 28 day strength, concrete, the space between ducts being not less than 2 inches and maximum size aggregate being 3/4 inch, and with not less than 3 inches of concrete around the outside of the duct or duct bank;
(3) be installed in trenches on thoroughly compacted earth with backfill thoroughly compacted;
(4) not be trapped unnecessarily;
(5) have top of envelope not less than 18 inches below finished grade;
(6) have all couplings made tight with suitable sealing compound.

b. Change of direction in raceway shall be made with radius of turn as long as possible, and preferably made as long radius sweeps. Unless otherwise indicated, for circuit voltages above 600 volts all elbows for raceways of 2, 2-12, and 3 inch size shall have a radius of not less than 36 inches and for 3-1/2 inch size and larger the radius shall be not less than 48 inches. For circuits 600 volts or less, the radius of elbows may be 12 inches less than specified for higher voltages. The elbow radius for all raceways banked together shall not be less than that required for the largest raceway in the bank.

c. Fittings for raceways shall be designed specifically for use with the type of raceway installed. No fitting shall be used nor any change be made in raceway type, size or configuration which might change cable while being pulled-in. All couplings and other connections shall be made tight and sealed to exclude water and concrete. Raceways entering building basements or similar type areas through walls below grade shall be installed through a seal fitting, O.Z. Gedney Type "FSK", Spring City Electrical Mfg. Co. Type "WDP", or equal, cast into the wall, with pressure sealing ring between the sleeve and the body of the fitting, and with pressure clamp, pressure rings and sealing grommet installed to seal between the fitting and the conduit. Raceways terminating above grade outdoors shall have a sealing terminator provided as noted on the Drawings.

d. Trenches shall be opened full length between terminal points before raceways are installed and, wherever possible, shall be graded so that raceways are not trapped and will drain toward one or both ends. Minimum depth of trench shall be such that the top of any duct bank will be not less than 24 inches below finished grade at any point.

e. Concrete encasement shall be provided for all underground raceways. Concrete shall have 3000 pound 28 day strength and 3/4 inch maximum sized aggregate. Not less than 3 inches of concrete shall be provided on all sides of each single raceway or duct bank. Care shall be taken that no voids are left between ducts and ducts are firmly held in place when concrete is poured. At riser points the concrete encasement shall extend not less than 4 inches above finished grade, unless otherwise indicated, and all raceways shall be coated with bitumastic paint or P.V.C. compound from a point 12 inches below to a point 6 inches above the top surface of the concrete.

f. Each main service raceway shall be equipped with a grounding conductor, sized as noted on the Drawings, but in no event, less than required by N.E.C. Sections 250-94 and/or 250-95. These grounding conductors shall be installed in each raceway with the ungrounded phase conductors.

g. Before cable is pulled-in all raceways shall be rodded and a mandrel and swab drawn through. Spare raceways shall have a solid No. 10 A.W.G., 600 volt insulated, copper wire pulled-in and left; except that, for non-metallic raceways the wire may be #8 solid, M.H.D. bare copper. Spare duct risers shall be capped or plugged at the point of termination with 18 to 24 inches of the pull-wire coiled inside just below the cap or plug.

06 EXCAVATION AND BACKFILLING:

a. Excavation necessary to receive the work, including excavation of rock and quicksand, shall be made to proper depth to provide a solid bearing, shall be shored as necessary, shall be kept dry by pumping as necessary, and shall be dry when the work is installed.

b. Other utility lines, if damaged by the work through lack of care in excavating, shall be repaired or replaced without additional expense to the Owner.

c. Backfilling shall be in layers not over 8 inches deep, each layer being thoroughly tamped, and shall be maintained against settlement until final acceptance of the work.

d. Areas with special surface treatment, such as sidewalks, streets, or other paved areas, shall have backfill compacted to match surrounding areas or be backfilled with crushed stone and surfaces shall be repaired using materials in no way inferior to the original materials and using labor skilled in the trades involved.

07 RACEWAYS AND FITTINGS:

a. Raceways and fittings shall be U.L. listed and labeled and shall be furnished and installed by the Contractor for all wiring systems.

b. Size of raceways and fittings shall not be smaller than called for herein or on the Drawings, and shall not be smaller than required by the N.E.C. for the number, size, and type of conductors therein.

c. Type of raceway to be provided shall be threaded rigid steel conduit for all applications with flexible steel conduit, standard or liquidtight as required, provided at motor terminals, recessed lighting fixtures, or other locations where a flexible connection is required. Exceptions, for other than Hazardous Areas as defined by Article 500 of the N.E.C., shall be limited to the following applications and raceway types.

(1) For all branch circuit wiring in spaces above hung ceilings and in hollow spaces of interior partitions, including the portion of this branch circuit wiring which is exposed only in areas such as wire closets and the like intended solely for electrical use, E.M.T., only in sizes 2" and smaller, may be used in lieu of rigid steel conduit.

d. Rigid steel conduit shall be either hot-dip galvanized, zinc metalized, or sherardized, but shall not be mixed. Fittings shall be zinc or cadmium coated, taper-threaded, cast-metal type. Requirements for specific applications or uses are as follows:

(1) All bushings shall be combination metal-and-plastic, insulating type, O.Z. Type "B", or Type "BLG" for grounding type, or approved equal. All-plastic bushings or removable-fiber or plastic inserts or liners will not be accepted.
(2) Couplings for use where conduit cannot be turned shall be O.Z. Type "SSP", or approved equal, neoprene-gasketed split couplings or "Erickson" couplings. Running threads will not be permitted.

(3) Expansion fittings to be provided at all building expansion joints shall be O.Z. Type "AX" or Type "EX", or approved equal, with bonding jumper, or where installed in concrete at a building expansion joint, shall be O.Z. Type "DX", or approved equal.

(4) Conduit bodies shall meet N.E.C. dimensional requirements, shall be cast-metal with screw-fastened covers, and shall be of Appleton Electric, Crouse-Hinds, Pyle-National, or approved equal, manufacture.

(5) Hazardous location raceways shall be provided with sealing and other type fittings as manufactured by Appleton Electric, Crouse-Hinds, or approved equal, which are U.L. listed and labeled for the class and division of hazard involved as indicated herein or on the Drawings.

e. Flexible steel conduit shall be zinc coated, single steel strip type. Connectors shall be Thomas & Betts "Tite-Bite" with insulated throat, except that factory-installed flexible steel conduit or steel flexible metallic tubing furnished with and as part of a U.L. labeled recessed lighting fixture assembly may have the manufacturer's standard connectors furnished therewith provided such connectors are U.L. listed and labeled or marked and a separate grounding conductor is furnished in the flexible conduit.

f. Liquidtight flexible conduit shall be U.L. listed and labeled as such. Connectors shall be Thomas & Betts, or approved equal, liquidtight connectors with screw-in ground cone and insulated throat.

g. Electrical Metallic Tubing (E.M.T.) shall be galvanized steel, thin-wall tubing. Couplings and connectors shall be zinc-coated, hex-nut, steel-compression-ring type, U.L. listed and labeled as "raintight", as manufactured by Thomas & Betts, Appleton Electric, or approved equal. Connectors shall have permanently-attached insulated throats. Removable fiber or plastic inserts or liners for connectors will not be accepted. Indenter type, set-screw type, or spring-steel so-called tap-on type connectors and couplings will not be accepted.

h. Installation of raceway systems shall conform with the following requirements.

(1) Routing of exposed raceways shall be at right angles or parallel to principal structural members and vertical raceways shall be plumb. Concealed raceways shall take the most direct route between outlets as allowed by obstructions. Raceways shall not block access openings or necessary access for operation or maintenance of equipment. Wherever possible,

trapped runs shall be avoided or 1/8" weep holes shall be provided at the lowest point.

(2) Structural members and reinforcing shall not be cut, burned, displaced, nor damaged in any way. Holes cut through existing walls or floors shall be neatly repaired. Holes through exterior walls for raceways shall be made weather-tight and holes through the roof for raceways shall be made waterproof with suitable pitch pockets. Holes through fire-rated walls and floors for raceways shall be sealed around the raceways with materials having an equal fire rating. Where sleeves are set in new walls or floors for raceways, all unused sleeves and spaces between the sleeves and the raceways shall be sealed in accordance with manufacturer's instructions with PR-855, fire resistant foam sealant manufactured by Chase Technology Corp., Huntington Station, New York, or approved equal, or be sealed with a packing of steel wool and a surface finish of water-proof cement plaster. Such sleeves intended for future use shall have the location of the sleeve clearly and permanently marked or indicated. Sleeves through floors of mechanical equipment rooms or other areas subject to possible flooding shall be extended at least 3 inches above the finished floor and shall be made water-tight. During construction open raceways shall be temporarily plugged or capped to prevent the entrance of dirt, trash, plaster, or other foreign matter.

(3) Bends, elbows and off-sets in raceways shall not exceed the equivalent of 4 quarter bends (360 deg. total) between pulling points and all necessary boxes or conduit bodies shall be provided to meet this requirement. Radius of bends shall not be less than given in N.E.C. Table 346-10; except that, only where space limitations require it and only under conditions given in N.E.C. Section 346-10, the radius of bends shall be not less than given in Table 346-10 Exception.

(4) All connections shall be wrench-tightened and electrically continuous. Where a threaded conduit enters a box or cabinet without a threaded hub, a locknut shall be provided outside the box and a locknut and insulated bushing provided inside the box.

(5) Supports for raceways shall be provided within 3 feet of each box, cabinet, or fitting and at least every 10 feet. For straight runs only of rigid steel conduit supports shall be provided on maximum

spacings given in N.E.C. Table 346-12. Support shall be with heavy duty, zinc-coated conduit hangers, screw or bolt-fastened clamps, or galvanized malleable iron one hole straps. Within 7 feet of the floor only one hole straps shall be used. For raceways exposed on exterior walls, above or below grade, or on other surfaces subject to dampness, galvanized malleable iron clamp backs or other means shall be provided to prevent raceways from bearing directly on damp surfaces. Clamps or clips or other supports which depend on spring tension only for holding them or the raceways in place will not be accepted; the only exception being, for support of branch circuit or communication system raceways, only where installed above hung ceilings, "Caddy" fasteners as manufactured by Erico Products, Inc., or approved equal, may be used where fastened directly to a ceiling furring structure member and not to the suspension tie-wires. Tie-wires or perforated pipe straps shall not be used for raceway supports.

(6) In earth raceway couplings shall be made water tight and raceways shall be encased in a minimum of 3" of concrete on all sides. For outdoor risers the concrete encasement shall extend not less than 4 inches above finished grade. Indoor risers, unless otherwise indicated, shall have a conduit coupling provided flush with the finished floor or pad, and all such indoor risers intended for future use shall have a threaded metal plug in the coupling flush with the finished floor. Risers shall be accurately located and shall be properly aligned so that vertical extensions will be plumb.

(7) In concrete slabs on grade there shall be at least 1 inch of concrete between the raceways and the bottom of the slab. In slabs above grade raceways shall be located near the center-line of the slab. Parallel runs of raceays in slabs shall not be spaced closer together than 3 diameters of the largest raceway, except at points where space limitations make closer spacing mandatory, such as at panelboard locations and the like.

08 SEALING OF RACEWAYS:

a. Sealing or effectively plugging the interior of raceways shall be provided under the following conditions in the manner specified.

b. In Hazardous Areas compound-filled sealing fittings shall be provided as required by N.E.C. Section 501-5 for Class I, Division 1 and 2, areas and as required by N.E.C. Section 502-5 for Class II, Divisions 1 and 2, areas. Sealing fittings shall be U.L. listed and labeled for use in such areas and generally shall be Appleton Electric Type "EYS" or "ESU" or Crouse-Hinds Type "EYS" or "EZS". At the bottom of vertical raceways or wherever moisture may collect, fittings shall be "drain seal" type, Appleton Electric Type "SF", or Crouse-Hinds Type "EYD".

c. Raceways connecting areas at different temperatures shall be sealed or effectively plugged to prevent air circulation and the resulting condensation of moisture in the raceways. This shall apply to raceways between air-conditioned and non-air-conditioned areas, heated and non-heated areas, inside and outside of buildings, inside and outside of refrigerated areas, boiler rooms, etc. Sealing shall be accomplished with compound-filled sealing fittings as manufactured by Appleton Electric or Crouse-Hinds, or with suitable sealing bushings as manufactured by O.Z. at the first pull box or cabinet on the warmer end of the raceway, or by stuffing the warmer end of the raceway with duct-seal, or other approved material not harmful to conductor insulation or jacket.

d. Where outdoor vertical raceways enter the top of equipment enclosures, compound-filled "drain seal" type sealing fittings, as manufactured by Appleton Electric or Crouse-Hinds, shall be provided.

e. Compound-filled sealing fittings shall have dams of asbestos fiber filler formed around and between conductors and compound shall be carefully poured to form the seal. The compound and fiber filler shall be provided by the fitting manufacturer.

09 BOXES:

a. All boxes shall conform with U.L. requirements and with the requirements of N.E.C. Article 370. Boxes shall be of code gage, formed, or formed and welded, sheet steel with galvanized or sherardized finish; or, where required, shall be of cast metal with threaded hubs or bosses and with galvanized or cadmium finish. Cast aluminum boxes shall not be provided in or in contact with any concrete.

b. Size of boxes shall not be less than called for on the Drawings nor less than required by the N.E.C. for the size and number of raceways connected thereto and for the size and number of conductors therein. Outlet boxes shall be single or ganged as required for the devices therein. Unless otherwise indicated, boxes shall be of the following types and not smaller than the sizes indicated.

(1) Ceiling outlet boxes shall be sheet steel, 4" octagonal, 2-1/8" deep for exposed or hung ceiling work and 3" deep for installation in poured concrete. Fixture studs and plaster rings shall be provided as required.

(2) Flush wall outlet boxes in dry-wall or similar type construction shall be sheet steel, 4" square, 1-1/2" deep, with extension rings where required. Flush wall outlets in exposed tile, marble, or concrete block walls shall be sheet steel, square-cornered type, approximately 2" wide, 3-3/4" high, and 2-1/2" or 3-1/2" deep, or ganged equivalent, Steel City Type GW, or approved equal.

(3) Surface mounted wall or column outlet boxes, indoor or outdoor, shall be cast metal "FS" or "FD" boxes as manufactured by Appleton Electric or Crouse-Hinds.

(4) Junction or pull boxes, sized in accordance with N.E.C. Sections 370-18 and 370-51, shall for general use be hot-dip galvanized sheet steel and shall be provided without knockouts, holes for raceways being drilled in the field with holes located to provide the largest possible bending radius for the conductors. Boxes requiring covers larger than 6 square feet shall have sectionalized covers and shall be equipped with cross-bracing in the box to which the cover sections shall be fastened at the seam. Sheet steel boxes outdoors shall have flanges turned to resist rainwater and conduit entrances shall be equipped with watertight hubs with insulated throats, Thomas & Betts Series 370, or approved equal.

(5) Cast metal junction or pull boxes for outdoor installation shall be hot-dip galvanized cast iron as manufactured by O.Z. Electrical Mfg. Co., or approved equal, and shall be provided with suitable gaskets.

(6) In hazardous areas cast metal junction or pull boxes, zinc or cadmium coated, shall be provided and in all Class I, Division I, areas shall be U.L. listed and labeled for such use.

c. Screw-fastened covers shall be provided on all boxes. Unless otherwise indicated, covers shall be of the same material and have the same finish as the boxes on which they are installed. Exceptions and special requirements shall be in accordance with the following.

(1) For flush-mounted wall outlets covers shall be minimum of .040" thick stainless steel, Type 430 specification grade with satin finish, all being oversized type with each dimension being approximately 3/4" larger than standard.

(2) For surface mounted wall or column outlets covers shall be cast metal type which shall be equipped with weatherproof hinged lift covers for switches installed outdoors and for convenience outlet receptacles installed indoors and outdoors.

d. Installation of boxes or conduit bodies is required for pulling-in and splicing conductors and shall be provided as necessary to limit length of unbroken raceway runs and to limit the number of bends between pulling points to the required number. Box installation shall also conform with the following requirements.

(1) Boxes shall not be installed in concrete beams unless so detailed and shall have no open knockouts or holes.

(2) Supports shall be provided for the weight involved and to withstand conductor pulling-in forces and shall comply with the requirements of N.E.C. Section 370-13. Clamps or other support devices which depend on spring tension only for holding themselves or exposed boxes in place will not be accepted. Boxes shall be properly aligned, well secured to raceways, and clear of foreign matter.

(3) Boxes specifically indicated or located on the Drawings shall be provided for future extension of or taps to the circuits therein and shall be adequately sized for this purpose.

(4) Mounting heights of outlets, measured to center of outlet, shall, unless otherwise indicated on the Drawings, be as follows, except that in unfinished tile, brick, or concrete block walls, mounting heights may be varied slightly, but consistently, from heights indicated to match joint pattern of wall material.

(a) Receptacles, flush, wall	1'-0" from floor
(b) Receptacles, surf., wall	4'-6" from floor
(c) Switches, wall	4'-6" from floor

10 CONDUCTORS:

a. Conductors, unless otherwise indicated, shall be soft annealed copper and for general power and lighting distribution and utilization circuits shall be stranded, with No. 10 and No. 12 A.W.G. being solid, and shall be the normally-manufactured product of one or more of the following manufacturers, even though all types specified may or may not be made by every manufacturer listed:

Anaconda Wire and Cable Co.
Cyprus Wire & Cable Co. (Rome)
General Cable Corp.
General Electric Co.
Okonite Co.
Hatfield Wire and Cable Division

b. Minimum size conductors shall be No. 12 A.W.G. for branch circuit work, and shall be No. 14 A.W.G., unless otherwise indicated, stranded, for motor control or other remote control work.

c. Insulation, suitable for the environment, shall be provided on all conductors in raceways, wireways, wiring gutters, and the like. Unless otherwise indicated, insulation shall be U.L. listed and labeled for conductor temperatures of not less than 90 deg. C. when dry and 75 deg. C. when wet. Labeling of conductors shall comply with requirements of Section 310-11 of the N.E.C. Thickness of insulation for conductors operating at 600 volts or less shall be as given in N.E.C. Table 310-13 for the type of insulation specified. Types of insulation shall conform with the following requirements.

(1) At 600 volts and below, insulation shall be cross-linked synthetic polymer, U.L. listed and labeled as Types USE, RHH and RHW, General Electric S.I. 58073, or approved equal. At the Contractor's option, only No. 10 A.W.G. and smaller may be U.L. listed and labeled Type XHHW, General Electric S.I. 58053, or approved equal.

(2) Fixture wire, where factory installed, shall be U.L. listed for use with and as part of each particular fixture; or, where field installed, shall be the same as the branch circuit wire as called for above, Type RHH-RHW or Types XHHW and shall not be reduced in size.

(3) For process instrumentation work shall be 7 strand, 16 gauge copper, insulated primary conductors, twisted, with an aluminum mylar shield; copper drain wire and extruded PVC jacket. Individual insulation on each conductor shall be 15 mils of PVC and 4 mils of nylon, all rated 600 volts. A corrugated aluminum tape with a fused blue tinted copolymer on both sides shall be

applied longitudinally. An outer jacket of black polyethylene shall be 45 mils thick, rated 600 volts. All cables shall be 3 conductors. Submit shop drawings for approval. Cable shall be Okonite Catalog Number 264-25-7401.

d. Special use conductors shall be in accordance with the following requirements.

(1) Multi-conductor cords shall be U.L. listed and labeled Type SO.

e. Color coding of all insulated conductors shall be provided consistently throughout the system. Coding shall be provided at all points of access to the wiring such as switchgear, panelboards, outlet and junction boxes, switches, motor controls, etc. Color coding shall conform with the following table and at switchboards and panelboards shall be connected so that phase identification follows the requirement of N.E.C. Section 384-3(f) that buses be arranged A, B, C from front to back, top to bottom, or left to right as viewed from the front of the equipment.

System Volts	Ground	Neutral	Ph. A	Ph. B	Ph. C
277/480, 4W.	Green	White	Black	Red	Blue
120/240, 3W.	Green	White	Yellow	---	Brown

Coding shall be achieved by the use of colored insulating materials in the smaller conductor sizes and by the use of colored insulating tapes or self-adhering wrap-around markers where colored insulations are not available.

f. The pulling-in of conductors shall be accomplished without injury to conductor or insulation or jacket. Conductors may be lubricated but shall not be coated with any substance injurious to insulation or jacket. All conductors in each raceway, other than in surface-metal-raceways, wireways, and the like, shall be pulled-in simultaneously. Conductor installation shall conform with the following requirements.

(1) Pulling tensions shall generally be applied directly to the conductors and maximum tension in pounds shall not exceed .008 times the circular milarea of the conductors, nor exceed 5000 pounds for very large cables, nor exceed maximum tensions recommended by the cable manufacturer. Where cable grips are used over the insulation and/or jacket, the limits specified above shall apply, except that the maximum tension shall not exceed 1000 pounds and the cable shall be cut off well back from the area covered by the grip and this cut off

end wasted. For pulling around bends the maximum sidewall pressure shall not exceed 300 pounds per foot of radius, i.e., the tension in the cable immediately as it leaves the bend must not exceed 300 times the bend radius in feet. For long runs with bends, wherever possible, the pulling point shall be the end of the raceway closest to the bends and the Contractor, if required in certain cases, shall use a dynamometer to assure that maximum pulling tensions are not exceeded.

(2) Bending radius of conductors shall never be less than 5 times the outside diameter for 600 volt conductors. The radius of pulleys or sheaves over which conductors may be pulled or the radius of reels on which conductors may be re-reeled shall not be less than minimum conductor bending radius.

(3) Support for conductors in vertical raceways shall be provided as required by N.E.C. Section 300-19. In panelboards, cabinets, etc., conductors shall be carefully trained and neatly formed, grouped, and laced or banded with nylon ties.

(4) Conductors shall never be "pulled through" any box, fitting, cabinet, manhole, handhole, or similar space where change of raceway alignment occurs, and never bind at bushings.

g. Splices and terminations for low voltage circuits shall be securely made with solderless lugs and connectors, Thomas & Betts "Lock-Tite", or approved equal as manufactured by Burndy or O.Z., and taped with 3M "Scotch" No. 33 Electrical Tape, except that for conductor sizes No. 10 A.W.G. and smaller, 3M "Scotchlok" Type R and Type B, or approved equal, insulated, spring-tension connectors may be used. "Wire nuts" with Bakelite or other rigid type insulating cover shall not be used. Where stranded insulated conductor ends may be exposed to the weather only closed-end lugs shall be used with taping between the cable insulation and the lug base to prevent the entrance of moisture into the insulated conductor stranding. All control-cable conductors and other stranded control, alarm, communication, and/or supervisory type circuit conductors No. 14 A.W.G. and smaller shall be terminated with spade-type self-insulating terminals, Thomas & Betts "Sta-kon," Burndy "Hylug", or approved equal. All lugs, connectors, and terminals shall be of the proper size for the conductors and strands shall not be cut from conductors.

11 PANELBOARDS:

a. Panelboards shall be U.L. listed and labeled, totally-enclosed, dead-front, bolt-in, molded-case circuit breaker type; meet NEMA standards; meet all requirements of Local Code enforcement authorities; and be the product of one of the following manufacturers:

General Electric Co.
I.T.E.-Gould
Square D Co.
Westinghouse Electric Corp.

b. Cabinets shall be code-gage, galvanized sheet steel, suitable for field painting where required, without knockouts, holes for raceways being field drilled for the raceways installed. Cabinet trims, for surface or flush mounting as indicated on the Drawings, shall have hinged doors, latches and pin-cylinder type locks, all keyed alike, and circuit directories on the inside of the doors. Cabinets shall provide gutter space and wire bending space at terminals not less than required by N.E.C. Section 373-6 for the number and size of conductors indicated on the Drawings. Factory finish for trims shall be light gray enamel over a rust inhibitor and shall also be suitable for field painting where so required.

c. Buses, including neutral and ground buses where required, and all necessary connections thereto shall be copper. Buses shall be full height and shall be properly drilled and tapped, or otherwise arranged, such that all spaces are usable for future branch circuits.

d. Size and arrangement of branch circuits shall be as indicated on the Drawings. All lighting or lighting and appliance panelboards shall be arranged distributed-phase.

e. Circuit numbering for single phase loads is indicated on the Drawings with consecutively numbered circuits of unlike polarity or phase. If panelboards are not so furnished, the Contractor shall re-number the panelboard branch breakers correspondingly to assure that common neutrals are provided only with phase conductors of unlike polarity.

f. Breaker handle protective devices shall be provided on all appliance and convenience outlet branch circuits of lighting and appliance type panelboards where the panelboard is used as normal switching means for lighting to prevent inadvertant switching of non-lighting circuits.

g. Types of panelboards shall conform with the following requirements:

(1) For 120 volt loads panelboards shall be rated 120/240 volts, 1 phase, 3 wire and each shall be equipped with insulated neutral bus and ground bus, and shall be G.E. Type NAB, or approved equal.

h. Shop drawings prepared by the manufacturer shall be submitted in quintuplicate for approval by the Architect/ Engineer. The submittal shall include cabinet dimensions and details, voltage ratings, main and branch circuit information, bus size and arrangement, etc., for each panelboard, and shall include catalog cuts and/or other descriptive data.

i. Installation of panelboards by the Contractor shall include the following work.

(1) Cabinets shall be rigidly supported and properly aligned with top of cabinet 6'-6" above the floor, unless otherwise indicated.
(2) Assemblies shall be checked for loose bolts and lugs, for having all parts assembled including filler plates, for short circuits by megger testing phase to phase and phase to ground.
(3) Directory cards shall be filled in, using a typewriter, identifying the panelboards and identifying the branch circuit loads including the approximate load locations where feasible.

12 NON-FUSIBLE DISCONNECTING SWITCHES:

a. Non-fusible disconnecting switches shall be furnished and installed by the Contractor where indicated on the Drawings and for the following purposes whether or not all are actually indicated on the Drawings:

(1) For motor circuits as required by N.E.C. Sections 430-101, 430-102, and 430-112 wherever combination type starters or separate circuit breakers or fusible switches which serve the same purpose are not provided.
(2) At motors rated 600 volts and less where not in sight of motor controllers as required by N.E.C. Section 430-86 (2), regardless of whether or not the controller disconnecting means can be locked.
(3) For separate-source motor control circuits as required by N.E.C. Section 430-74 (a).

Disconnecting switches shall be U.L. listed and labeled, and, other than 125 volt snap or tumbler type, shall be the product of one of the following manufacturers.

General Electric Co.
I.T.E.-Gould
Square D Company
Westinghouse Electric Corp.

Where the circuit run includes a neutral and/or a grounding conductor, provision shall be made for terminating these conductors in the enclosure.

b. Size and type of disconnecting switch for various applicatiosn shall be as indicated on the Drawings and/or in accordance with the following requirements.

(1) For individual motor loads rated above 120 and below 600 volts disconnecting switches shall be heavy-duty, quick-make and quick-break type, and shall be horsepower rated through 100 horsepower. Above 100 horsepower non-automatic molded-case circuit breakers (without automatic trips), having a continuous current rating of not less than 125% of motor full load current shall be provided.

(2) For 120 volt single phase individual motor loads, rated 1/3 horsepower or smaller, disconnecting switches shall be snap or tumbler type rated not less than 15 amperes at 125 volts, A.C. only. Above 1/3 horsepower switches shall be for operation on A.C. only, shall be horsepower rated, and shall have a continuous current rating of not less than 125% of full load current.

(3) For combination loads switches shall be heavy-duty, quick-make and quick-break type, and the ratings in horsepower and amperes shall not be less than required by N.E.C. Section 430-110(c). This, in general, requires the horsepower rating to be not less than the total connected horsepower, and the ampere rating to be not less than the locked-rotor current of the largest motor, or group of motors to be started simultaneously, plus the full load amperes of all other loads connected thereto.

c. Indoor enclosures for switches shall be NEMA Type 12, enclosure, with provision for pad-locking in the OFF position; except that snap or tumbler type 125 volt switches shall be mounted in boxes and equipped with device covers as specified under the heading BOXES. Outdoor enclosures shall be NEMA Type 4, stainless steel.

d. Installation shall be such that switches are rigidly supported and readily accessible with operating handle not over 6'-6" above the floor or finished grade; except, where installed as a second disconnecting means at a motor not in sight of its motor controller and/or where the driven equipment is not readily accessible, the switch shall be located at the equipment as permitted by N.E.C. Section 380-8, Exception No. 2.

13 INDIVIDUAL DRY TYPE TRANSFORMERS:

a. Individual dry type transformers shall be U.L. listed and labeled for 500 KVA and smaller, shall be sized as indicated on the Drawings, shall be built in accordance with NEMA-ANSI standards, shall be self-cooled, two-winding type, and shall have totally enclosed windings Single phase units shall be rated 480-120/240 volts, 60 Hz.. Transformers shall be the product of one of the following manufacturers:

General Electric Co.
Heavy-Duty
ITE-Gould
Sorgel Electric Co.
Westinghouse Electric Corp.

b. Full capacity taps shall be provided in the high voltage windings of all transformers. Transformers 30 KVA and larger shall have 4 2-1/2% taps below and 2 2-1/2% taps above rated primary volts.

c. Average sound levels in decibels shall not be higher than NEMA-ANSI requirements for the various sizes.

d. Installation of transformers shall be such that air circulation around the units is not restricted. The proper transformer taps shall be connected to provide actual operating secondary voltage between 117 and 122. Mounting of and connections to transformers shall be as detailed on the Drawings. Transformers shall be floor mounted.

14 RECEPTACLES:

a. Receptacles shall be U.L. listed and labeled with NEMA-ANSI standard contact configurations in the ratings for which standards have been established and which are available, and be brown color in all areas with cover plates as specified under the heading BOXES, and be wired in accordance with N.E.C. requirements. Receptacles shall be Hubbell 5262.

15 TUMBLER SWITCHES:

a. Tumbler switches shall be rated 15 amperes at 120/277 volts A.C. only, and shall be Bryant Cat. No. 4801, for S.P.S.T., Cat. No. 4802, for D.P.S.T., Cat. No. 4803 for 3 way, and Cat. No. 4804, for 4 way, or equal. Cover plates shall be stainless steel.

16 MOTORS:

a. Motors shall be furnished by the supplier of each piece of driven equipment.

b. All motors furnished under other sections of these Specifications shall conform with requirements given in the following paragraphs and generally shall conform with U.L., N.E.C., and NEMA standards and requirements.

c. Voltage ratings of alternating current (60 Hz.) motors shall be as follows:

(1) 1/3 horsepower and smaller -- 115 volts, single phase.

(2) 1/2 through 300 horsepower -- 460 volts, 3 phase.

Motors shall be capable of delivering rated horsepower output successfully and continuously under conditions of voltage variations of 10% above and below rated voltage. Pump motors shall have a 1.15 service factor.

d. Size of motors shall be established by the manufacturer of the driven equipment, and shall be adequate to assure the sqecified output and/or proper operation of the driven equipment without loading the motors beyond nameplate full-load ratings. In addition to having sufficient horsepower-output rating at rated speed, all integral horsepower motors shall have performance characteristics which will allow, without injurious overheating of the motors, accelerating the WK^2 of the load from stand-still to rated speed under conditions of: (1) two starts in succession (coasting to rest between starts) with the motors initially at ambient temperature, and, (2) one start with the motors initially at temperature not exceeding their rated-load operating temperature. The Contractor's attention is specifically directed to the fact that thermal characteristics of motors with regard to capability for accelerating the WK^2 of the load may vary greatly from motor manufacturer to motor manufacturer, not withstanding that the horsepower rating may be the same, and it is the Contractor's responsibility to provide motors with adequate thermal starting characteristics as well as adequate rated-speed operating characteristics. In the event that motors are provided by others than the manufacturers of the driven equipment, the Contractor shall submit all necessary performance data, calculations, and the like, in quintuplicate to the Architect/Engineer for approval to prove that the motors so furnished are adequately rated for the load served. Service factors shall conform with NEMA standards; however, since service factors are only applicable at rated nameplate voltage and frequency and since all system voltages are subject to some variation, service factors above unity shall not be applied in sizing motors. Motor sizes indicated on the Drawings and/or called for in these Specifications are generally based on published data of the equipment manufacturer specified and shall not relieve the Contractor of the responsibility for furnishing motors adequately sized for the equipment furnished; and, in the event that substitute equipment is proposed and accepted, which for reasons of reduced equipment efficiency or other causes required motors of greater horsepower, all increases in the electrical system costs resulting therefrom shall be borne by the Contractor.

e. Three phase motors shall be squirrel-cage induction type, unless otherwise indicated. Motors shall generally be NEMA Design B (normal-torque, low starting current); or, for high inertia or widely varying loads or where motors start under load, shall be NEMA Design C (high-torque, low starting current) or NEMA Design D (high-torque, low starting current, and medium or high slip), as required to properly accelerate the loads and react to load variations.

f. Fractional horsepower single phase motors shall generally be squirrel-cage induction type and shall be NEMA Design N. Motors shall be shaded-pole, split-phase, or capacitor type.

g. Motor insulation, unless otherwise indicated, shall be non-hygroscopic, NEMA Class F, 60 deg. C. rise by resistance above a maximum 40 deg. C. ambient at not over 3300 feet altitude, at 1.15 service factor. Standard 40 deg. C. ambient motors installed outdoors in direct sunlight shall not be loaded more than 90% of nameplate rating to compensate for possible high-ambient conditions; or, motors specially rated and applied to loads to provide high-ambient compensation by other means, as approved by the Architect/Engineer, shall be furnished. Stator windings shall be thoroughly impregnated by multiple dips and bakes with insulating varnish. Where epoxy encapsulated windings are called for, the encapsulation shall be applied by the vacuum and pressure process.

h. Bearings shall be of a suitable type for the size, type, and application. Generally, ball bearings shall be provided for motors 200 horsepower and smaller and sleeve bearings provided for larger sizes. Thrust bearings, suitably rated for the application, shall be provided where necessary.

i. Motor enclosures for general indoor applications shall be open-dripproof type.

j. Space heaters suitable for operation on 120 volts, shall be provided within the enclosure of all motors 10 horsepower and larger.

k. Windings and number of leads brought to the motor terminal fitting shall be suitable for the starting arrangement specified or indicated on the Drawings. Oversized terminal fittings or boxes shall be provided where necessary to accommodate the number and size raceways to be connected thereto.

l. The dynamic balance, overspeed withstand capability, and sound power levels of motors shall conform with NEMA standard requirements, unless otherwise indicated.

m. Any motor starting shall not exceed 974 amperes, (809 KVA) locked rotor current at 480 volts.

17 MOTOR INSTALLATION:

a. All motors on motor operated equipment indicated to be wired and connected hereunder shall be checked for proper clearances and alignment and shall be lubricated, if necessary. Motors shall be megger tested before being energized, shall be checked for proper direction and ease of rotation, and shall be left in satisfactory operating condition with motor space heaters, where supplied, properly connected and energized.

b. Megger tests on insulation of all motors before they are energized shall be made between a winding lead and the motor frame. Where both ends of individual windings are brought out, windings shall be temporarily connected together for testing or separate windings may be individually tested. Megger readings after 1 minute of megger test run should not be less than given in the following table; otherwise, the motors shall not be energized until corrective measures have been taken by the motor supplier to improve winding insulation. The Contractor shall ascertain the winding temperature with a reasonable degree of accuracy before, making megger tests since, as indicated by the table, low insulation resistance readings resulting from moisture absorption will vary greatly with temperature variations.

DEGREES WIND. TEMP.		RESISTANCE IN MEGOHMS FOR MOTOR VOLTAGES SHOWN		
F.	C.	115V.	230V.	460V.
37	2.8	60	118	230
50	10	32	60	120
68	20	13	26	50
86	30	5.6	11	21
104	40	2.4	4.6	8.8
122	50	1.0	2.0	3.7
140	60	0.44	0.82	1.55
167	75	0.12	0.23	0.44

c. Raceway connections to motors shall be by means of short sections of flexible metallic conduit, which outdoors shall be U.L. listed and labeled liquidtight.

.18 PILOT DEVICES AND CONTROL CIRCUITS:

a. All pilot devices, such as pushbutton stations, selector switches, thermostats, firestats, smoke switches, pressure switches, limit switches, float switches, control switches, control and timing relays, flow switches, pneumatic-electric switches, recorder controllers, and the like, shall be furnished for and with the driven or operated equipment, unless otherwise specified herein or indicated on the Drawings, to provide all control and supervisory functions specified and indicated for the driven or operated equipment and/or for the system of which the driven or operated equipment is a part.

b. Pilot devices generally shall be heavy-duty industrial type, shall have precious metal contacts conservatively rated to withstand the inrush and continuous currents to which they will normally be subjected, and shall be properly insulated for the control system voltage. Momentary contact pushbuttons, maintained contact selector switches, and pilot lights shall be General Electric CR-2940 heavy duty, or heavy duty oil-tight, with all contacts rated 10 amperes at 600 volts, or equal products as manufactured by Allen-Bradley, Cutler-Hammer, I.T.E.-Gould, Square D Co., or Westinghouse Electric Corp. Device enclosures shall be suitable for the type and class of area and for the environment in which they are installed and shall have all necessary provisions for external connections thereto. Devices shall be firmly and accessibly mounted and shall be set or adjusted as necessary to provide proper control and operation of the driven equipment and/or system.

c. Control circuits generally shall operate at 120 volts, 60 Hz., unless otherwise indicated, supplied by adequately sized control-power transformers complete with short circuit and overcurrent protection to meet N.E.C. Article 725 requirements or requirements of Part F of Article 430. "Hand-off-automatic" selector switches shall be provided to permit manual control of all functions normally automatically controlled; however, the "Hand" position shall only bypass normal control function devices and shall not by-pass safety devices, such as high or low pressure cutouts, high temperature cutouts, limit switches, and the like. Pilot lights shall be provided to indicate equipment and/or system status in accordance with NEMA standards and as follows:

Red-----On, Fast, Forward, Up, Energized, Closed, Alarm.
Amber---Slow, Reverse, Down, Intermediate or Transient Condition, Warning.
Green---Off, Ready, Deenergized, Open, Safe.

d. All control circuit wiring indicated schematically or otherwise on the electrical Drawings shall be provided under this Section of the Specifications, including all necessary raceways, boxes, terminal cabinets, etc., required therefor. Control wiring not indicated on the electrical Drawings shall be provided under the requirements of the Section of the Specifications wherein the driven equipment and/or the control system is specified. All control wiring provided under these Specifications shall conform with requirements indicated and with the requirements of approved wiring diagrams provided by the equipment or system manufacturer or supplier.

19 INDIVIDUAL CIRCUIT BREAKERS:

a. Individual circuit breakers shall be U.L. listed and labeled molded-case type with trip-free, automatic, thermal-magnetic trip mechanisms, shall be sized as indicated on the Drawings, and shall be the product of one of the following manufacturers.

General Electric Company
I.T.E.-Gould
Square D Company
Westinghouse Electric Corp.

Where the circuit run includes a neutral and/or a grounding conductor, provision for terminating these conductors shall be made in the breaker enclosure.

b. Indoor enclosures for circuit breakers shall be NEMA Type 12, with provision for pad-locking in the OFF position outdoor enclosures shall be NEMA 4, stainless steel.

c. Installation shall be such that circuit breakers are rigidly supported and readily accessible as required by N.E.C. Section 240-24 (a), with operating handle not over 6'-6" above the floor or finished grade. Where used as overcurrent protection for a feeder tap, the installation shall comply with the requirements of N.E.C. Section 240-21, which, in general, requires that tap conductors not over 10 feet long shall have ampacity not less than the trip setting of the circuit breaker, and tap conductors between 10 and 25 feet long shall have ampacity not less than 1/3 the ampacity of the feeder, and shall terminate in a single overcurrent device. Where necessary, the full-sized feeder, or a full-sized tap therefrom, shall be so routed as to comply with this requirement. Where conductors 1/3 the ampacity of the feeder are too large to fit the circuit breaker lugs, the full-sized feeder or full-sized tap shall be routed to within 10 feet of the circuit breaker.

20 INDIVIDUAL LOW VOLTAGE MOTOR CONTROLLERS:

a. Individual low-voltage motor controllers or starters shall be furnished by the supplier of each piece of driven equipment, unless otherwise indicated herein or on the Drawings.

b. All motor controllers furnished under these Contract Documents shall be horsepower rated in NEMA standard sizes for the size motor served, shall comply with all U.L., N.E.C., and NEMA requirements, and shall provide overload protection in every ungrounded phase conductor serving each motor. All overload units for controllers to be installed outdoors, in boiler rooms, in refrigerated rooms, unheated areas, and the like, shall be ambient-compensated type. Motor controllers shall be the product of one of the following manufacturers.

Allen-Bradley Co.
Furnas Electric Co.
Cutler-Hammer
General Electric Co.
I.T.E.-Gould
Square D Company
Westinghouse Electric Corp.

c. For 115 volt single phase motors, motor controllers shall be manually operated, across-the-line starting type, unless otherwise indicated.

d. For 3 phase motors 5 horsepower and smaller motor controllers shall be magnetically operated, across-the-line starting type.

e. Combination motor controllers shall have externally-operated molded-case magnetic-trip breakers properly sized for the motor or equipment served, mounted and factory wired in the same enclosure with the motor controller.

f. Indoor enclosures shall be NEMA 12.

g. Control power transformers complete with necessary fuses shall be provided, unless otherwise indicated, in the motor controller enclosure for all electrically operated motor controllers and associated control equipment. Control voltage shall be 120 volts, 60 Hz., unless otherwise indicated. Transformers shall be adequately sized for operation of the motor controller and auxiliary equipment associated therewith.

h. Necessary extra interlocks and cover mounted control devices, as required, shall be provided.

i. Shop drawings and other material shall be submitted in quintuplicate to the Architect/Engineer for approval for all motor controllers. Material shall include enclosure types with outline dimension, weights, schematic wiring diagrams, electrical ratings and characteristics of all component parts including duty-cycle limitations where applicable, catalog cuts, and other descriptive and performance data. All material submitted shall be identified by the Contractor with the name and/or number of the driven equipment for which it is intended. Material submitted for each piece of driven equipment shall be complete and shall not be submitted "piece-meal". "Typical" drawings or other material shall have the applicable portions thereof clearly marked and identified.

j. Installation by the Contractor shall include firmly mounting motor controllers with overload re-set button or switch, or with operating handle of circuit breaker or switch for combination types, not over 6'-6" above the floor or finished grade. All bolts, lugs, and other connections shall be checked for tightness. All moving parts shall be checked for proper alignment and freedom of movement. All time-delay or sequencing relays shall be checked and properly adjusted or set. Controllers shall be checked for installation of properly sized overload heater units and all breaker instantaneous trip units shall be set as low as possible to allow motors to start.

21 GROUNDING:

a. A grounding system, conforming with requirements of N.E.C. Article 250 and with applicable local codes, shall be provided as specified herein and as indicated on the Drawings for grounding building and other above-grade structures, electrical equipment, electrically operated equipment, electrical systems neutrals, metallic raceway systems, etc.

b. The words "bonded" and "connected", where applied to grounding requirements, shall have the following meaning. All underground connections, connections concealed within the building or other structures, and all connections made otherwise inaccessible by permanent construction, shall be made by brazing, welding, or a thermit process such as Cadwelding, all such connections being made by workmen skilled in the trade. All exposed or otherwise accessible connections shall be made using approved grounding clamps, lugs and through-bolts or welded-on stud bolts, or other fittings specifically approved for such use such as grounding bushings, and the like. Care shall be taken that all surfaces at grounding connections are clean and free of rust and corrosion, paint, oil, grease, or other insulating material. Straps or other materials, which are not inherently or otherwise protected against rust and corrosion, shall not be used for grounding connections. Aluminum conductors, clamps, or other fittings shall not be used for grounding.

c. For outdoor electrical structures, equipment and distribution work, grounding shall be provided as specified previously, as indicated on the Drawings, and as required by the N.E.S.C. and the N.E.C. Minimum depth for horizontal grounding loops and leads direct buried in earth shall be 2'-6". Ground rod "deltas" or "clusters" where indicated shall consist of three 3/4" x 10' Copperweld ground rods driven vertically not less than 10 feet apart and bonded together with 4/0 bare copper in a closed delta configuration. Grounding loops indicated to be outside of buildings or other structures shall be 4/0 bare copper direct buried approximately 3 feet outside of the building lines.

d. For new building structures a grounding mat or grid shall be provided in accordance with details on the Drawings and with the following requirements. The Contractor is specifically referred to the structural foundation plans and details for information on types and depths of foundations to be provided, etc. The grounding installation shall be coordinated with the installation of building foundations.

(1) A horizontal loop, electrically and mechanically continuous, of 4/0 bare stranded copper shall be provided under and around the periphery of the building embedded, wherever possible, within the poured concrete grade beams, column footings, and/or pile caps, etc., and located at and tied to the lowest level of steel reinforcing bars therein, or where no reinforcing exists, located within approximately 3 inches of the bottom.

(2) Additional intermediate horizontal ties, connected to the peripheral loop at both ends, shall be provided where indicated on the Drawings crossing under the building interior beneath the floor slabs. Where such ties cross, they shall be bonded together.

(3) Where deep column footings, caissons, or concrete-filled piles are provided at the building periphery and at intermediate horizontal tie locations a vertical 4/0 tap shall be provided from the horizontal loop or grid conductor to the bottom of the footing caisson, or pile, except that such vertical taps need not be provided at closer horizontal intervals than 20 feet.

(4) Where only shallow (less than 5 feet below finished grade) footings and/or grade beams are provided, not less than one 3/4 inch by 10 foot copperweld ground rod shall be provided for each 80 lineal feet or fraction thereof of horizontal loop or grid conductor. Such ground rods shall be driven vertically in the footing hole or grade beam trench and the horizontal loop or grid conductor shall be bonded to the top of the rod.

(5) Risers of 4/0 bare copper, or larger where so indicated, from the grounding loop or grid to the building interior shall be provided as indicated on the Drawings and/or as specified herein for direct connection thereto of electrical service equipment, etc., as required. Where two or more paralleled connections are called for, they shall be made at separate points on the loop or grid and follow separate routing to the equipment or item to be grounded. Risers to equipment or items mounted on floors on grade shall rise directly under the equipment or item or closely adjacent thereto.

(6) All underground water piping systems shall be bonded to the grounding loop at the point the piping enters the building. Bonding jumpers shall be provided around all piping joints equipped with insulating type gaskets within 20 feet of the point of entry into the building and around water meters.

e. Ground buses of all motor control assemblies shall be connected to the underground grounding loop or grid with 4/0 copper conductor in accordance with the following requirements.

(1) All service-entrance switchgear shall be connected to the grounding loop or grid with not less than two separate 4/0 grounding conductors, one connection being made to each end of the switchgear ground bus.
(2) All unit substations shall have a separate 4/0 grounding connection made between the underground grounding loop or grid and the substation primary compartment or equipment and bonding jumpers provided between this point and the transformer frame or enclosure and between the transformer frame or enclosure and the secondary switchgear ground bus. A separate 4/0 grounding connection shall also be made to the opposite end of the secondary switchgear ground bus.

g. The secondary neutral of all transformers, unless otherwise indicated, shall be grounded in accordance with the following requirements. Secondary neutrals shall be grounded at one point only, except as required by N.E.C. Section 250-23(a) for service transformers outside a building and service-entrance equipment inside the building. Conductors for grounding each neutral shall not be smaller than required by N.E.C. Table 250-94 nor smaller than 12-1/2% of the cross-sectional areas of the largest secondary phase conductor.

(1) Transformers without secondary switchgear shall have the neutral grounded at the transformer and a bonding jumper shall be provided between the grounded neutral and the transformer enclosure. Where so indicated on the Drawings, the grounding connection shall be to the building ground loop or grid or by means of a grounding conductor pulled into the raceway with the circuit serving the transformer primary. Where no specific method of grounding is indicated, the secondary neutral shall be grounded to the nearest 2 inch or larger cold water pipe and in steel framed buildings to the building structure.
(2) Two-wire secondaries of transformers such as control transformers shall have one leg grounded to the equipment enclosure and/or to the metallic raceway system.

h. Motor control center ground buses shall be grounded with conductors sized not less than required by N.E.C. Table 250-94 or 250-95, as applicable, nor less than indicated on the Drawings.

j. All sections of flexible conduit, other than 1-1/4" and smaller "liquidtight", shall have an insulated grounding conductor, color coded green, and sized in accordance with N.E.C. Table 250-95, therein. The conductor shall be terminated on both ends of the flexible section in the nearest box, terminal fittings, equipment enclosure, etc., by means of bolted lugs, ring type terminals, or grounding type bushings. Where the grounding conductor is not specifically called for to be inside the raceway, either on the Drawings or in other paragraphs of these Specifications, the Contractor has the alternative of providing a grounding jumper around and on the outside of the section of flexible conduit. The jumper shall be taped to the flex at at least 2 points and shall be properly terminated at each end with suitable grounding clamps, straps, or bolted lugs.

22 IDENTIFICATION:

a. Identification for various portions of the electrical work shall be provided in accordance with the following:

(1) Conductors shall be color coded as specified under the heading CONDUCTORS. Feeder circuits shall be tagged at all points of access such as tap and pull boxes and shall be identified at panelboards and the like with the feeder designations corresponding with those given on the control center breakers or other source devices.

(2) Panelboard designations shall be stenciled on the inside of trim doors.

(3) All remote mounted motor controllers, disconnecting devices, or other manually operable control devices shall be identified with the name of the equipment controlled or with the function of the device clearly indicated. Such identification may be accomplished by stenciling on the front of the device or by the providing of engraved laminated rigid plastic plates fastened to the device cover. Where a surface suitable for stenciling or mounting of a plastic plate does not exist, a painted and stenciled metal plate or a metal-backed engraved laminated plastic plate shall be provided and firmly mounted on or adjacent to the control device.

(4) Self-adhesive embossed flexible plastic tapes or "free-hand" lettering for identification of devices and equipment will not be accepted.

23 SUPPORTING MATERIALS:

a. Firm, neat supports shall be provided for all electrical equipment, devices, and raceways. Supports shall have adequate strength for the purpose intended, including allowances for external forces that may be applied, such as operation of switch or breaker handles or pulling-in of conductors.

b. Supports for interior work shall be steel hanger rods, shop-coated standard steel shapes, or prefabricated structural systems as manufactured by Kindorf, Unistrut, Powerstrut, or equal. Perforated pipe straps, tie wires, and spring type clips will not be accepted. In wire closets, electrical equipment rooms, and other unfinished dry places, where individual control devices, junction boxes, etc., are grouped together for surface mounting, with the permission of the Owner's authorized representative a 2-coat prepainted, 3/4 inch exterior grade plywood backboard may be provided for mounting equipment thereon.

c. Supports for outdoor work shall be hot-dip galvanized steel shapes with shop connections welded before galvanizing and all field connections bolted. Prefabricated systems as manufactured by Kindorf, Unistrut, Powerstrut, and the like, will not be accepted for outdoor supports.

d. Support fastenings shall be galvanized or cadmium plated bolts, beam clamps, or welded studs on steel work; shall be Erico Products "Caddy" fasteners, or approved equal, for branch circuit work above hung ceilings except that such support shall be from the hung ceiling framing and not from individual tie wires supporting the ceiling framing structure; shall be galvanized toggle bolts on hollow tile or concrete block; shall be Phillips "Red-Head", or approved equal, self-tapping steel anchors, or inserts in solid concrete or masonry; and shall be wood screws on wood. Fiber, plastic, or wood plug anchors will not be accepted. In all damp or wet areas zinc or cadmium coated washers, or other suitable spacers, shall provide an air space of not less than 1/4" between boxes, equipment enclosures, etc., and the supporting surface.

e. Concrete for equipment pads, foundations, and underground raceway incasement shall have 3000 pound, 28-day strength. Except where installed in dedicated electrical equipment rooms or vaults, which are not subject to flooding, or on electrical equipment platforms or mezzanines, all indoor floor mounted switchgear, switchboards, transformers, motor controllers and motor control centers, and the like, shall be installed on 4" high concrete pads. Outdoor concrete pads or foundations for such equipment shall be provided as detailed on the Drawings. Concrete pads with 6" minimum thickness, unless otherwise detailed, shall be provided for all isolated outdoor equipment racks or supporting structures.

24 PAINTING:

a. All exposed raceways, fittings, boxes, supports, panelboards, cabinets and the like, shall be prepared for painting by removing therefrom all oil, grease, and dirt and by masking all equipment nameplates to prevent their being painted. All such items shall be painted by the Contractor by applying 3 coats of paint, color as selected by the Owner. Paint shall be of DuPont, Sherwin-Williams, Pittsburg, or equal, manufacture, with Pittsburg No. 811, or equal, Galvanized Iron Primer being used on all galvanized surfaces.

b. Motor control equipment, lighting fixtures, wiring devices, and similar apparatus, other than panelboards, with factory applied finish shall not be painted, but any surface scratched or marred during shipment or erection shall be touched-up using materials which match original surfaces.

25 LIGHTING FIXTURES AND LAMPS:

a. All lighting fixtures and lamps shall be furnished by the Contractor, unless otherwise indicated. Fixtures shall be assembled, adequately supported, properly aligned, connected, properly grounded, lamped, and maintained in operating condition by the Contractor during construction, and all fixtures shall be clean and all lamps operating at the time of final inspection and acceptance of the work. Fixtures shall not be operated unnecessarily during construction and all fixtures necessarily operated for extended periods of time shall be re-lamped with new lamps just prior to final inspection. All fixtures shall be U.L. listed and labeled and installation shall comply with the requirements of N.E.C. Article 410. The Contractor's attention is specifically directed to N.E.C. Section 410-16(b) regarding fastening of fixtures supported by suspended ceiling framing members. Where ceiling framing is not adequate for support, fixtures shall be supported from the structure above. Fixtures may be used as raceways only as allowed by N.E.C Article 410-31, Exceptions 1 and 2, and shall not contain circuits other than lighting branch circuits. Exact location of fixtures shall be determined by coordination with other trades and be approved by the Owner's authorized representative.

b. Ballasts for fluorescent fixtures shall be high power factor, C.B.M. Certified and U.L. listed and labeled, quiet operating type, as manufactured by General Electric, Jefferson, Universal, or approved equal. Ballasts for outdoor installation shall be designed for low temperature operation.

c. Ballasts for H.I.D. fixtures shall be U.L. listed and labeled, high power factor type, designed for the type of lamp with which they are used and providing a starting current not greater than normal operating current. Mercury ballasts generally shall be constant-wattage type.

d. Lamps generally shall be of General Electric, Sylvania, or Westinghouse manufacture. For special purpose fixtures lamps shall be of the type recommended by the fixture manufacturer. Incandescent lamps generally shall be inside frosted, 120 volt, extended service type having an average life rating of not less than 2500 hours. Reflector lamps and/or PAR lamps shall have an average life rating of not less than 2000 hours. Fluorescent lamps generally shall be T-12 or T-17, standard cool white, rapid start or slimline as required. Mercury lamps shall be "Deluxe White".

e. Fixture type designations are indicated on the Drawings. Fixtures shall be furnished as specified in the Fixture Schedule for each designated type, or shall be similar and equal thereto as approved by the Architect/Engineer. Catalog cuts, fixture construction details, and performance data, clearly identified for each fixture type, shall be submitted in quintuplicate to the Architect/Engineer for approval.

26 LOW VOLTAGE MOTOR CONTROL CENTER:

a. Low voltage motor control center shall be furnished and installed under this Section of the Specifications. Equipment shall be metal-enclosed, free-standing, shall comply with NEMA, U.L., and N.E.C. standards and requirements, shall be designed for operation on a 480 volt, 3 phase, 4 wire, 60 Hz. system, and shall be braced and components (including all circuit breakers and/or circuit protectors) applied to withstand possible short circuit currents up to 42,000 amperes, RMS symmetrical, including motor feed-back contribution. Equipment shall conform with requirements for NEMA Class II, Type C. The equipment shall be the product of one of the following manufacturers, or equal, provided all specific requirements of these Specifications are met and provided necessary minor modifications in arrangement, etc., as approved by the Architect and Engineer, to adapt the arrangement indicated on the Drawings to the selected manufacturer's standard design do not result in additional cost to the Owner or Architect and Engineer.

Cutler-Hammer
Furnas Electric Co.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.

b. Buses and all other internal conductors and wiring shall be copper. Main horizontal buses shall be rated as shown on the Drawings and vertical buses rated 300 amperes, minimum, with phase arrangements as required by N.E.C. Article 384-3 and with minimum clearances as required by N.E.C. Article 384-26. A full-length ground bus and a half size neutral bus, complete with drilling and lugs for required conductors, shall be provided. The ground bus shall have a bus-grounding lug for 4/0 copper cable in each end compartment or section.

c. Enclosures shall be NEMA 12, industrial use, dusttight and driptight, shall be fully-compartmented with gasketed, hinged doors for access to all equipment; shall be approximately 20 inches deep; and shall have adequate vertical and horizontal wireways, the main horizontal wireway being at the bottom. Bending-space for all wiring shall not be less than required by N.E.C. Article 373-6. Enclosures shall be primed and finished, inside and outside, with the manufacturer's standard colors.

d. Components in motor control centers shall comply with the following general and/or special requirements. All components shall be U.L. labeled unless otherwise approved by the Architect and Engineer.

(1) Overcurrent protective devices generally shall be molded-case circuit breakers with thermal-magnetic trip units, with breaker sizes and trip settings as indicated on the Drawings or properly sized for protection of the load served. For combination type motor controllers the circuit breakers (motor-circuit-protectors) shall have adjustable, magnetic-only type trip units properly applied in accordance with N.E.C. requirements for the rating of each motor. When the interrupting rating of any particular conventional circuit breaker is inadequate for the specified short circuit current, a breaker of higher interrupting rating but with the same trip settings shall be provided. All disconnecting devices shall be operable from outside the equipment compartment and shall be capable of being locked in the OFF position.

(2) Motor controllers shall be magnetically operated, combination circuit breaker, non-reversing type, reduced voltage type where noted, with additional features as noted on the Drawings. Controllers shall be the proper NEMA size for the motor with NEMA Size 1 being minimum size.

Ambient- compensated thermal overload protection shall be provided in all three phases. Unless otherwise indicated, each controller shall be equipped with a control power transformer for 120 volt, 60 Hz., control complete with primary and secondary protective devices. Where the Drawings indicate a separate control source, the disconnecting means for the controller shall have an extra pole or N.O. interlock to break the control circuit or a separate switch for the control circuit shall be provided. Extra interlocks, contactors, auxiliary timing and control relays, etc., as required for the control functions indicated on The Drawings, and/or as required for the proper functioning of the type of controllers called for, shall be provided. For multi-speed motors time delay relays shall be provided to delay closing of the low-speed contactor when switching from high to low speeds. Unless otherwise indicated, all autotransformers, resistors, reactors, etc., required for the types of controllers indicated shall be provided in the motor control centers.

(3) Pilot devices for cover mounting, such as pushbuttons, pilot lights, selector switches, etc., shall be heavy duty type. Each motor controller shall be equipped with pilot lights which indicate: red for ON, FAST, FORWARD or UP; amber for DOWN, REVERSE or SLOW; green for OFF.

(4) Nameplates of the engraved laminated plastic type (cardholder type), which shall be filled in by the Contractor using a typewriter), shall be provided for each motor controller or other device which identifies and gives the location of each load served.

(5) Instruments and meters shall be of the flush or semi-flush mounted type with suitably calibrated dials or charts. All instruments shall have instrument switches with knurled round handles or push buttons. All ammeters shall be Sangamo Electric Co., Lincoln ammeter, Type ADF, 15 minute, thermal demand type with instantaneous ammeter. All voltmeters shall indicate phase to phase voltage.

(6) Shop drawings of the equipment shall be submitted in quintuplicate to the Architect and Engineer for approval. Drawings shall include dimensioned plans and elevations giving equipment weights, space for external wiring, anchor bolt locations, etc.; shall include a schedule of all units, accessories, and nameplates; and shall include wiring diagrams as required for the class of equipment specified. Catalog cuts or other descriptive data shall be provided covering all items being furnished.

(7) Installation of the equipment shall include all necessary assembly and connection of separate shipping sections and components, mounting and anchoring of the equipment, making all necessary external raceway and wiring connections thereto, checking all connections for tightness, checking all moving parts for alignment and ease of operation, checking all draw-out components for proper contact of stabs, installing all overload heaters, setting breaker instantaneous trip units as low as possible to allow motors to start, etc., conducting complete operational and functional tests of each motor controller or other device, and making such wiring corrections and equipment adjustments as may be necessary to assure proper operation of the equipment including control sequences.

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS:

That GULF INSURANCE COMPANY, a corporation of the State of Missouri, hereinafter called Company, Does hereby appoint

TRENTON TUNNELL, JR. OR WILLIAM L. HIX OR WINNIE L. NORRIS OR ROBERT L. POTTS, JR.
OR LEROY N. MYHRE OR JERRY BOUTWELL OR JUDY D. AVERETT OR CINDY F. RICKS OR
SANDRA JO FLOYD OR J. BENSON MYERS OR CHARLES R. UNDERWOOD OR FRED W. WOODWARD, JR.
ATLANTA, GEORGIA

its true and lawful Attorney-in-fact to make, execute, seal and deliver on its behalf, as surety, any and all bonds and undertakings of Suretyship.

The execution of such bonds or undertakings in pursuance of these presents shall be as binding upon the Company as if they had been executed and acknowledged by the regularly elected officers of the Company.

This Power of Attorney is issued pursuant to and by authority of the following resolution of the Board of Directors of the Company, adopted effective September 29, 1961, and now in full force and effect:

"Resolved that the President or any Vice President or any Secretary may appoint Attorneys-in-fact in any State, Territory or Federal District to represent this company and to act on its behalf within the scope of the authority granted to them in writing, which authority may include the power to make, execute, seal and deliver on behalf of this Company as surety, and as its act and deed any and all bonds and undertakings of suretyship and other documents that the ordinary course of surety business may require, including authority to appoint agents for the service of process in any jurisdiction, State or Federal and authority to attest to the signature of the President or any Vice President or any Secretary and to verify any affidavit or other statement relating to the foregoing, and to certify to a copy of any of the by-laws of the Company and to any resolutions adopted by its Board of Directors; and any such Attorney-in-fact may be removed and the authority granted him revoked by the President or any Vice President or any Secretary or by the Board of Directors."

This Power of Attorney and Certificate of Authority is signed and sealed by facsimile under and by authority of the following resolution voted by the Board of Directors of the Gulf Insurance Company at a meeting duly called and held on the 24th of July, 1973.

"Resolved that the signatures of Warren J. Kwedar, President, or of Frederick Boger, Senior Vice President, or of Arthur C. Werden, Vice President, or of Jack W. Maynard, Vice President, or of William E. Elston, Vice President, or of Douglas Simpson, Secretary, or of R. C. Fetherston, Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Attorneys-in-fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached."

In witness whereof, the Company has caused this Power of Attorney to be signed and its corporate seal to be affixed by its authorized officer this 11th day of Feb. 19 81 .

(SEAL)

By J W Maynard
JACK W. MAYNARD VICE PRESIDENT

STATE OF TEXAS
COUNTY OF DALLAS } ss:

On this 11th day of Feb. 19 81 , before me, a Notary Public of the State and County aforesaid, residing therein, duly commissioned and sworn, personally came the above named officer of the Company, who being by me first duly sworn according to law, did depose and say that he is that officer of the Company described in and which executed the foregoing instrument; that he knows the seal of the Company; that the seal affixed to such instrument is the corporate seal of the Company; and that the corporate seal and his signature as such officer were affixed and subscribed to the said instrument by the authority and direction of the Company.

(SEAL)

Clifford R. Beard
CLIFFORD R. BEARD NOTARY PUBLIC

My commission expires the 30th day of June 19 84 .

CERTIFICATE

I, The undersigned, do hereby certify that the original Power of Attorney of which the foregoing is a true and correct copy is in full force and effect, and the foregoing resolution is a true and correct transcript from the records of the Company, and that the above named officer was on the date of execution of the foregoing Power of Attorney authorized to execute this Power of Attorney.

In witness whereof, I have hereunto subscribed by name and affixed the corporate seal of the Company this day of 19 .

(SEAL)

Douglas Simpson
DOUGLAS SIMPSON SECRETARY

Form 1 S 977 (9-73)

SET TAB STOPS AT ARROWS

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Certificate of Insurance

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES LISTED BELOW.

NAME AND ADDRESS OF AGENCY

COOK, VIRDEN & PHARR, INC.
P. O. BOX 20138
ATLANTA, GEORGIA 30325

NAME AND ADDRESS OF INSURED

W. L. CAREY, GENERAL CONTRACTOR, INC.
P. O. BOX 441
ROYSTON, GEORGIA 30662

COMPANIES AFFORDING COVERAGES

COMPANY LETTER	**A**	THE HOME INSURANCE COMPANY
COMPANY LETTER	**B**	PACIFIC INSURANCE COMPANY
COMPANY LETTER	**C**	
COMPANY LETTER	**D**	
COMPANY LETTER	**E**	

This is to certify that policies of insurance listed below have been issued to the insured named above and are in force at this time. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies.

COMPANY LETTER	TYPE OF INSURANCE	POLICY NUMBER	POLICY EXPIRATION DATE	Limits of Liability in Thousands (000)	EACH OCCURRENCE	AGGREGATE
A	**GENERAL LIABILITY** ☒ COMPREHENSIVE FORM ☒ PREMISES—OPERATIONS ☒ EXPLOSION AND COLLAPSE HAZARD ☒ UNDERGROUND HAZARD ☒ PRODUCTS/COMPLETED OPERATIONS HAZARD ☒ CONTRACTUAL INSURANCE ☒ BROAD FORM PROPERTY DAMAGE ☒ INDEPENDENT CONTRACTORS ☒ PERSONAL INJURY	GA-9966688	8/24/81	BODILY INJURY	$ 300	$ 300
				PROPERTY DAMAGE	$ 250	$ 250
				BODILY INJURY AND PROPERTY DAMAGE COMBINED	$	$
				PERSONAL INJURY		$ 300
A	**AUTOMOBILE LIABILITY** ☒ COMPREHENSIVE FORM ☒ OWNED ☒ HIRED ☒ NON-OWNED	BA-6153469	8/24/81	BODILY INJURY (EACH PERSON)	$ 250	
				BODILY INJURY (EACH ACCIDENT)	$ 500	
				PROPERTY DAMAGE	$ 100	
				BODILY INJURY AND PROPERTY DAMAGE COMBINED	$	
B	**EXCESS LIABILITY** ☒ UMBRELLA FORM ☐ OTHER THAN UMBRELLA FORM	PI-000227	8/24/81	BODILY INJURY AND PROPERTY DAMAGE COMBINED	$3,000	$3,000
A	**WORKERS' COMPENSATION and EMPLOYERS' LIABILITY**	PWC-9747484	8/24/81	STATUTORY		
					$ 100 (EACH ACCIDENT)	
"RE:	**OTHER** INDEMNIFICATION AGREEMENT: CONTRACT LIABILITY IS INCLUDED. SEE INDEMNIFICATION AGREEMENT CLAUSE ON THE REVERSE SIDE OF CERTIFICATE."					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES

LOCATION: MIDDLE OCONEE RAW WATER STATION, JOB NO. 800024
BLASTING COVERAGE IS INCLUDED TO THE EXTENT TO WHICH SUCH RISK IS PRESENT.
"RE: CHANGE OR CANCELLATION: POLICIES CERTIFIED WILL NOT BE CHANGED OR CANCELLED WITHOUT TEN (10) DAYS PRIOR NOTICE TO THE OWNER AND THE ENGINEER, AS EVIDENCED BY RETURN RECEIPTS OF REGISTERED OR CERTIFIED LETTERS."

~~Cancellation: Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will endeavor to mail ____ days written notice to the below named certificate holder, but failure to mail such notice shall impose no obligation or liability of any kind upon the company.~~

NAME AND ADDRESS OF CERTIFICATE HOLDER:

OWNER: CITY OF ATHENS, GEORGIA
CITY HALL, ATHENS, GA. 30603
ENGINEER: ROBERT AND COMPANY ASSOCIATES
96 POPLAR STREET, N. W.
ATLANTA, GEORGIA 30335

DATE ISSUED 3/9/81

COOK, VIRDEN & PHARR, INC.

AUTHORIZED REPRESENTATIVE
LAWRENCE D. COOK, JR.

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HOLD HARMLESS AGREEMENT AS SPECIFIED UNDER 34A:

34."CONTRACTOR'S HOLD HARMLESS AGREEMENT - INSURANCE:

A. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FROM THE TIME OF SIGNING THE CONTRACT, OR FROM THE TIME OF THE BEGINNING OF THE FIRST WORK, WHICHEVER SHALL BE THE EARLIER, FOR ALL INJURY OR DAMAGE OF ANY KIND RESULTING FROM THIS WORK, TO PERSONS OR PROPERTY. THE CONTRACTOR SHALL EXONERATE, INDEMNIFY AND SAVE HARMLESS THE OWNER AND THE ENGINEER FROM AND AGAINST ALL CLAIMS OR ACTIONS, AND ALL EXPENSES INCIDENTAL TO THE DEFENSE OF ANY SUCH CLAIMS, LITIGATION AND ACTIONS, BASED UPON OR ARISING OUT OF DAMAGE OR INJURY (INCLUDING DEATH) TO PERSONS OR PROPERTY CAUSED BY OR SUSTAINED IN CONNECTION WITH THE PERFORMANCE OF THIS CONTRACT OR BY CONDITIONS CREATED THEREBY OR ARISING OUT OF OR ANY WAY CONNECTED WITH WORK PERFORMED UNDER THIS CONTRACT AND SHALL ASSUME AND PAY FOR, WITHOUT COST TO THE OWNER OR THE ENGINEER, THE DEFENSE OF ANY AND ALL CLAIMS, LITIGATIONS AND ACTIONS, SUFFERED THROUGH ANY ACT OR OMISSION OF THE CONTRACTOR OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED UNDER THE SUPERVISION OF ANY OF THEM."

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INSURANCE BINDER

THIS BINDER IS A TEMPORARY INSURANCE CONTRACT, SUBJECT TO THE CONDITIONS SHOWN ON THE REVERSE SIDE OF THIS FORM.

Binder No. 1

NAME AND ADDRESS OF AGENCY

COOK, VIRDEN & PHARR, INC.
P. O. BOX 20138
ATLANTA, GEORGIA 30325

COMPANY THE HOME INSURANCE COMPANY

Effective 12:01 A.m MARCH 9, 1981
Expires ☒ 12:01 am ☐ Noon MAY 9, 1981

☐ This binder is issued to extend coverage in the above named company per expiring policy # (except as noted below)

Description of Operation/Vehicles/Property

NAME AND MAILING ADDRESS OF INSURED

CITY OF ATHENS, GEORGIA,
ROBERT AND COMPANY ASSOCIATES, AND
W. L. CAREY, GENERAL CONTRACTOR, INC.

PROPERTY

Type and Location of Property	**Coverage/Perils/Forms**	**Amt of Insurance**	**Ded.**	**Coins. %**
BUILDERS' RISK COVERING THE CONSTRUCTION OF ONE WATER INTAKE STRUCTURE FOR THE CITY OF ATHENS, GEORGIA, MIDDLE OCONEE RAW WATER STATION, JOB NO. 800024.	FIRE AND EXTENDED COVERAGE	$1,451,000		

LIABILITY

Type of Insurance

☐ Scheduled Form ☐ Comprehensive Form
☐ Premises/Operations
☐ Products/Completed Operations
☐ Contractual
☐ Other (specify below)
☐ Med. Pay. $ Per Person $ Per Accident
☐ Personal Injury

Coverage/Forms

☐ A ☐ B ☐ C

Limits of Liability

	Each Occurrence	**Aggregate**
Bodily Injury	$	$
Property Damage	$	$
Bodily Injury & Property Damage Combined	$	$
Personal Injury		$

AUTOMOBILE

☐ Liability ☐ Non-owned ☐ Hired
☐ Comprehensive-Deductible $
☐ Collision-Deductible $
☐ Medical Payments $
☐ Uninsured Motorist $
☐ No Fault (specify):
☐ Other (specify):

Limits of Liability

Bodily Injury (Each Person) $
Bodily Injury (Each Accident) $
Property Damage $
Bodily Injury & Property Damage Combined $

☐ WORKERS' COMPENSATION — Statutory Limits (specify states below) ☐ EMPLOYERS' LIABILITY — Limit $

SPECIAL CONDITIONS/OTHER COVERAGES

NAME AND ADDRESS OF ☐ MORTGAGEE ☐ LOSS PAYEE ☐ ADD'L INSURED

LOAN NUMBER

COOK, VIRDEN & PHARR, INC.

Lawrence D Cook

Signature of Authorized Representative

LAWRENCE D. COOK, JR.

Date 3/9/81

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CONDITIONS

This Company binds the kind(s) of insurance stipulated on the reverse side. This insurance is subject to the terms, conditions and limitations of the policy(ies) in current use by the Company.

This binder may be cancelled by the Insured by surrender of this binder or by written notice to the Company stating when cancellation will be effective. This binder may be cancelled by the Company by notice to the Insured in accordance with the policy conditions. This binder is cancelled when replaced by a policy. If this binder is not replaced by a policy, the Company is entitled to charge a premium for the binder according to the Rules and Rates in use by the Company.